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ORGANIZATION, POWERS, AND DUTIES OF THE UNITED STATES PUBLIC HEALTH SERVICE TODAY.

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The Federal Public Health Service is a bureau of the Treasury Department. Beginning as the Marine Hospital Service, through successive acts of Congress it has undergone a process of evolution so that all of its duties are essentially of a public health character, and it is organized with a view to their performance.

The central bureau at Washington, which is presided over by the surgeon-general, has seven divisions, as follows:

1. Personnel and accounts.
2. Foreign and insular quarantine and immigration.
3. Domestic (interstate) quarantine and sanitation.
4. Sanitary reports and statistics.
5. Scientific research.
6. Marine hospitals and relief.
7. Miscellaneous.

Each of the six divisions first mentioned is in charge of an assistant surgeon-general, who is directly responsible for administrative matters in connection with his division. In the absence of the surgeon-general the officer next in rank acts in his stead. This is the officer who has charge of the Division of Personnel and Accounts, and who has immediate supervision of the entire personnel and appropriations, and the preparation of the annual estimates therefor.

Through the Division of Foreign and Insular Quarantine and Immigration are administered all matters relating to maritime quarantine and medical inspections of aliens. In the field this division is represented by forty-four quarantine and inspection stations scattered along the several coasts in the continental United States, twenty-five insular stations, and

thirty-seven stations located at foreign ports, and eighty-three immigration stations.

Through the Division of Interstate Quarantine are administered all matters relating to the control of contagious and infectious diseases in interstate traffic. In the field this division is represented by officers engaged in the inspection of Government buildings, suppression of plague outbreaks, and control of epidemics of typhoid fever and other diseases in coöperation with state and local authorities.

The Division of Sanitary Reports and Statistics handles all matters relating to the collection of morbidity reports, reports of epidemics, and of information pertaining to the geographic distribution of disease and to climate in relation to health and disease. It prepares and publishes the weekly Public Health Reports and reprints therefrom.

In the field it is represented by officers of the service wherever stationed, and through the Department of State by American consuls at foreign ports. In the United States it depends largely on the voluntary coöperation of state and municipal authorities to furnish information and forward reports of sanitary conditions within their respective jurisdictions.

The Division of Scientific Research administers all matters relating to investigations of contagious and infectious diseases and matters pertaining to the public health wherever made. In the field it is represented by the Hygienic Laboratory with its four divisions, the plague laboratory in San Francisco, the leprosy investigation station in Hawaii, the pellagra investigation station at Savannah, Ga., the station at Wilmington, N. C., for the investigation of the parasites of man, and by officers engaged in investigations of typhoid fever, Rocky Mountain spotted fever, poliomyelitis, etc., in different parts of the country, and sanitary surveys of navigable waters wherever conducted.

In the Division of Marine Hospitals and Relief are administered all matters connected with the care and treatment of seamen and recruiting for the several bureaus of the department. In the field it is represented by twenty-two marine hospitals and one hundred twenty-one relief stations.

In the Miscellaneous Division are handled all matters in relation to the care and distribution of publications, and to the examinations of surfmen of the Life Saving Service, and to claims for disability in that service.

Today the Public Health Service has a corps of approximately 450 medical officers, 50 pharmacists, and a total personnel of about 2,000.

Advisory Conferences on Administrative Matters.

Under the Constitution and existing statutes, the Federal Public Health Service is restrained from assuming duties that properly devolve upon state and municipal authorities. But their relations are so intimate that Congress has made provision not only for coöperation, but for conferences on

public health matters. In the public health law of July 1, 1902, provision is made for annual conferences between the Public Health Service and state boards and departments of health. Provision is also made for special conferences with all or a part of the state health organizations, and upon the application of not less than five state health authorities, a special conference must be called. The deliberations pertain particularly to administrative measures. In effect, there is thus provided an advisory council on administrative matters, which in its development will insure coöperation and be an arbiter on vexed sanitary questions, and in which each state is entitled to representation.

Advisory Conferences on Scientific Matters.

In the previously mentioned law Congress also provided for an advisory board for consultation relative to investigations to be inaugurated and the methods of making them in the Hygienic Laboratory. This board consists of nine members, four of whom are officers of the Government, the remaining five being scientists eminent in laboratory work and connected with the leading endowed institutions of the country. By this means the service is brought in touch with the great scientific laboratories, and may avail itself of advice from the highest sources.

Congress has thus made provision for councils in respect to both administrative and scientific matters. Their utilization in the highest degree is one of the most important means of development of public-health organization and public-health work.

The foundations have been laid for further development and for the performance of a greater amount of efficient sanitary work. In order that health administration shall be effective, however, it must be adequately supported by appropriations, and it is the securing of these and their wise expenditure that constitute efficient administration.

Federal Health Administration in Relation to Foreign Intercourse.

Federal health administration had for its fundamental object the prevention of the introduction into the United States of pestilential diseases. As long ago as May 27, 1796, a national law authorized the President to direct the revenue officers and revenue cutters to aid in the execution of quarantine, and also in the execution of the health laws of the states. As a further means of aiding foreign commerce, provisions were made in successive navigation laws to promote the health and comfort of passengers at sea, and in 1798, provision was also made for the care and treatment of persons employed in the merchant marine.

Foreign and Insular Quarantine.

The necessity for more and more extensive Federal supervision over international traffic was made apparent by repeated epidemics. The

first permanent quarantine law, passed April 29, 1878, was a result of the widespread and severe epidemic of yellow fever during the previous year. The passage of the law of February 15, 1893, was intimately associated with the outbreak of cholera in Europe in 1892, and the quarantine act of June 19, 1906, followed the epidemic of yellow fever in the Southern States in 1905. Under the above-mentioned laws and a few minor ones, there was finally developed the national system of quarantine as it exists today—a system, the development of which occupied approximately 100 years.

All quarantine operations in the United States are conducted under the supervision of the Federal Government, and, with two or three exceptions, all stations are conducted by Federal officers.

Sanitary Supervision of Immigration.

A long series of immigration laws have been enacted between the periods March 20, 1819, and February 20, 1907, their general objects from a hygienic standpoint being the improvement of the health and comfort of arriving aliens, and the development of a stronger race in the United States.

On arrival at domestic ports, all aliens are required to undergo medical inspection, and for those suffering with disease, hopsitals are maintained. The object of the medical supervision of immigration is to exclude the physically and mentally unfit, and especially the latter, who will endow their offspring with an unstable mentality, thereby bringing about the further increase of insanity in the United States. This medical inspection is conducted by the Public Health Service.

Federal Health Administration in Relation to Interstate Intercourse.

The administrative procedures in international sanitation having been established, and their further improvement assured, the great public health problems of the Nation are now of an interstate and intrastate character.

The Federal public health statutes are based upon, or are carefully in accord with that clause of the Constitution which gives the right to Congress to regulate commerce between the states. On account of the far-reaching effect of interstate intercourse on our national life, the field for public health activities on the part of the Federal Government is wide. But it must not be occupied in such manner as to usurp the power of the states or impair the efficiency of state and local public health authorities.

The first Federal statute relating to the public health provided that there should be coöperation between Federal and local authorities, and this principle has been recognized in all subsequent legislation and followed in its enforcement.

Quarantine and Sanitation.

Under the quarantine act of February 15, 1893, the secretary is author-

ized to issue regulations for the prevention of the spread of infectious and contagious diseases from one state to another, where the regulations of the states are inadequate. These regulations may be enforced by state and local authorities, but the Federal Public Health Service is authorized to coöperate in their enforcement, and should the states fail or refuse, the President may adopt such measures as in his judgment shall be necessary.

The powers under the above-mentioned statutes are broad, and the extent of their enforcement by the Federal Government depends on the facilities provided, the necessities in each case, and the state of public opinion in respect to the advantages of sanitation. Examples of work of this character that may be mentioned are coöperative measures for the collection and examination of rodents to prevent plague; anti-typhoid campaigns in urban and rural districts, and sanitary surveys of interstate and international waters in relation to the prevention of the spread of typhoid fever.

There is necessity not only of quarantine measures to prevent the spread of communicable diseases, but sanitary measures to prevent their propagation. These include the sanitation of trains and vessels and the supplies used aboard, the regulation of conditions under which the employees of common carriers work, and the exclusion of dangerous or infected merchandise from transportation.

The Control of Epidemics.

On account of the relation of epidemics to the hygienic and commercial welfare of the country, the Federal Public Health Service may, under the provisions of the above mentioned law, assume responsibilities in respect to their control under the direction of the Secretary of the Treasury and the President. In the event of outbreaks of cholera, yellow fever, smallpox, plague, or typhus fever in any part of the United States, the President is also authorized to cause regulations to be issued and enforced to prevent their spread, and an epidemic fund of approximately half a million dollars is appropriated annually for expenditures of the Federal Public Health Service in suppressing epidemics of these diseases.

It is under such authority that the epidemics of yellow fever in the Southern States, the outbreaks of plague in California and our island possessions, and similar outbreaks have been handled. In every instance, however, there has been thorough coöperation on the part of the Federal, state and local authorities. The equity of our form of Government requires that the two latter shall exercise their police powers to the fullest extent, and it is on request of these authorities that the Federal Government goes to their assistance. This may be advisory in character, or may assume a more active form.

When material aid is extended, the Government's funds are required to

be expended by officers of the Federal Public Health Service, and these latter are, therefore, placed in charge, and have the coöperation of state and local officials as well as officers of the Federal Government.

The occurrence of epidemics affords opportunity for investigations of an epidemiologic and research character, and advantage is taken of such situations. As an example may be mentioned the studies of plague in California and typhus fever in Mexico City, of yellow fever, of dengue, and a number of others.

Control of Biologic Products in Interstate Traffic.

The dangers to the public health from the exploitation of contaminated or inert biologic products impelled Congress to pass the act of July 1, 1902, regulating the propagation and sale in interstate traffic of viruses, serums, toxins and analogous products. By its provisions, licenses are issued to establishments to engage in such traffic. Prior to the issue of licenses inspections are made of each establishment by officers of the United States Public Health Service, and examination is made of all products for which license is desired. These examinations are repeated from time to time, samples obtained in the open market being used.

Collection and Collation of Sanitary Information.

The successful administration of public health laws depends essentially upon a knowledge of the existence and current prevalence of communicable diseases, the conditions that favor their propagation and spread, and the measures that are required for their control.

Information is received by the Federal Public Health Service from American consuls throughout the world regarding dangerous diseases that exist or are epidemic in foreign ports.

Of even greater importance to the health of the country are the collection and collation of sanitary information and reports regarding the prevalence of diseases and the occurence of epidemics within the states. This work on the part of the Federal Government is carried on with the voluntary coöperation of state and local authorities.

Sanitary information and reports of the occurrence and prevalence of disease are collected and published by the United States Public Health Service.

The extent to which notification of cases of sickness can be carried out depends upon the facilities provided the Federal Public Health Service and, primarily, upon the development of local health organization within the respective states. The difficulties encountered in the enforcement of the notification of cases of disease in the United States are not unlike those encountered by sanitary authorities abroad, but in overcoming them there will be performed one of the most important duties in connection with the preservation of the public health.

Dissemination of Information Relating to the Public Health.

Sanitary reports and statistics and the results of scientific investigations are of value only as they are made public and used. An important administrative measure, therefore, is the distribution of public health literature and the presentation of the public health lectures and exhibits. By these means the Federal Public Health Service has been able to disseminate a considerable amount of sanitary information and participate in the educational propaganda.

Among the publications issued are the Hygienic Laboratory bulletins, bulletins of the Yellow Fever institute, Public Health bulletins, the weekly Public Health reports, and miscellaneous documents. The Hygienic Laboratory bulletins represent the results of scientific investigations conducted in the laboratory. The Public Health bulletins are popular in character, and are utilized to convey sanitary information to health officials and to the public generally. The weekly Public Health reports are issued primarily for the benefit of health authorities as an aid in administration. Their utility is recognized throughout the world, and their improvement as contemplated will render them the most useful organs in health administration in this country.

The Public Health bulletins are to be further popularized and made of interest to individuals, and they should be distributed by millions.

Investigations of Matters Pertaining to the Public Health.

Another important function of the Public Health Service in relation to the public health, and perhaps the most important one, is the conduct of scientific investigations. By this means Federal administration in public health matters is simplified and rendered more accurate; local authorities are likewise aided, and through them the people are benefited by being taught the degree of sanitary excellence that may be attained.

By an act of March 3, 1901, investigations of contagious and infectious diseases and matters pertaining to the public health were given definite status in law. Provision was made whereby laboratory investigations would be systematically carried on. Through this provision and in connection with the enforcement of the quarantine laws investigations have been made in Washington and different parts of the country. In order to comply with the law, however, this work was carried on largely through the Hygienic Laboratory.

By an act of Congress approved August 14, 1912, broader powers were conferred on the Public Health Service to "study and investigate the diseases of man and conditions influencing the propagation and spread thereof, including sanitation and sewage and the pollution, either directly or indirectly, of the navigable streams and lakes of the United States."

There is thus abundant authority for both laboratory and field investiga-

tions by the Public Health Service. As in the past the investigations will be conducted by officers specially trained and with such coöperation as state and local health authorities may be able to render. But in order that the great needs of the country may be met, more men and more money must be provided and the Public Health Service must have the active support of individuals, professional associations, and other organizations to be benefited.

Congress has shown a beginning appreciation of the need for more men and more money, by a liberal appropriation to be used for investigations of the diseases of man and the conditions influencing their propagation and spread, and the pollution of the navigable waters of the United States. Increased appropriations were also made for the work of the Hygienic Laboratory and an additional building authorized.

Many highly important problems await solution. Among them may be mentioned the standardization of biologic and other therapeutic products, the determination of the conditions causing pellagra and certain other diseases, the extent of the migrations of tuberculous and other patients from one locality to another, the ascertainment of the influence of artificial illuminants on health, the determination of the relation of housing and other conditions to labor efficiency, and the prescribing of reasonable standards to control stream pollution.

Requests are received daily from all parts of the country for information regarding sanitary problems and methods of handling them. These requests are an excellent indication of the amount and extent of work to be performed in the immediate future. In one section of the country the question of the pollution of streams is pressing for solution; in another, it may be industrial accidents and poisoning; in another, the question of the reduction of infant morbidity; and in still another, the measures that must be taken to eradicate malaria and other communicable disease. Federal health administration involves a wise selection of the problems to be investigated and the securing of appropriations necessary to carry them on.

To summarize briefly: The natural lines of development of the Public Health Service may well be, first, in the increase of its activities in regard to vital statistics, mortality and morbidity; second, in a great extension of its field of research, especially with a view of establishing minimum sanitary standards of every description; third, in enlarging the extent of its coöperation with state and local boards of health; and, fourth, in greatly increasing its powers of diffusing knowledge.

All will agree, I am sure, that the development of the Public Health Service in such directions portends a future rich in possibilities for public health achievement, and that all who have the health interests of the country at heart should join forces in trying to bring those things to pass.

Discussion.

PROFESSOR W. T. SEDGWICK: I cannot let this opportunity go by without saying a word for the splendid service with which Doctor Anderson is connected and which he so honorably represents. It so happens that I know a good deal about it, and I have been struck with the wonderful organization and efficiency which the national, that is, the Federal public health service now has. In 1880 or 1881, or thereabouts, we had a national board of health for two or three years. It did good work. It was composed of excellent men. But the time was not ripe for it, and, before we knew it, it went out of existence. Then out of the Federal Marine Hospital Service, as has been stated so concisely and accurately by Doctor Anderson, has grown up what we call today the United States Public Health Service, and I have been surprised to see how ignorant people are about this. People are going even today up to the President of the United States and saying, "We want a national board of health, we want a national bureau of health, or something of that kind." Why, gentlemen, we have already got it. We have got a splendid national health organization, described by this very paper which Doctor Anderson has read to us. It is true it has still some technical terminology; it has a surgeon-general, and the officers are called surgeons and passed assistant surgeons, and all that sort of thing. But there is mighty little surgery in it today. It is good straight public health work. I am sorry that those terms are still attached to it, but they are, and they don't hurt the men who are doing the work a bit, and they don't hurt the public that is getting the work done. We ought, instead of going and pleading for a national bureau of health, as some people are doing today, to strengthen the arm of this service which is already on deck, which has got an appropriation of $200,000 to investigate streams and all sorts of things—interstate streams—and to do good, straight, sanitary work. I was very eager to have a representative of that service, primarily of course, Doctor Blue,—the head of it, the distinguished investigator, you remember, of the plague on the Pacific Coast, the man who did more than anybody else I suppose to keep the plague from running over this country,—to have him come and have you all see and hear him today; but he had to go to the Pacific Coast, and so he delegated Doctor Anderson, the chief of that wonderful laboratory which belongs to the service, to come and talk to us. We had to cut him down to twenty minutes, and so his paper has been too concise. But I just want every member of the Association to feel, as I do, that we have got now in the United States a national board of health, or what amounts to that—a United States Public Health Service. It is ready to come, whenever invited, to help investigate epidemics, to help test the quality of biologic products, toxines and vaccines and serums and the like, and to lend a hand to the states and to the cities whenever they want help. It is a splendid step forward, and something of which we ought to be very proud. I feel that we ought to apologize to Doctor Anderson for cutting him down in time, and I could not help getting up and saying what I feel in regard to this Service, that it is an honor to the United States of America today and compares favorably with the national health service of any country on the face of the globe.

A RECENT CONTRIBUTION OF THE FEDERAL GOVERNMENT TO PREVENTIVE MEDICINE AND HEALTH CONSERVATION.

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Read before the General Sessions, American Public Health Association, Colorado Springs, September, 1913, and before the Massachusetts Association of Boards of Health, July 31, 1913.

The United States Government, through the Bureau of Labor Statistics of the newly created Federal Department of Labor, aims to discover the true death hazard of wage earners, by age groups, sex and race, within the several occupations, and hopes to disseminate that knowledge widely among the people, together with information concerning other phenomena and accompanying circumstances of living that plausibly may explain interruption of life within age periods normally, of greatest economic efficiency. Such an educative campaign as that of which this Vol. XIV of the 19 volume U. S. Senate Document No 645, 61st Congress is the first concrete illustration, and cotton manufacturing, the industry initially thus studied, would seem to form no unimportant part, therefore, in the modern crusade to conserve health, and to be an essential prerequisite to the success of Preventive Medicine.

Especially noteworthy, perhaps, among incidental results accomplished through this inquiry are the following:

1. Recognition and thorough demonstration of the inherent and practical superiority of the death rate or induction method which (except for three descriptive pages inserted chiefly as an illustration of the usual or inspection method), is employed exclusively throughout this work; is the

II. Recognition that practically for any study into anti-longevity causes, age group 15 to 44 alone is amply representative of an industry's health characteristics, and overwhelmingly so as regards such industries as largely employ females. For since it is shown that regularly only about one third of the aggregate deaths of individuals aged 10 years and over (and hence potentially of working age), fall within age group 15 to 44, a practical application of this sufficiency of age group 15 to 44 for any ordinary investigation into conditions affecting longevity, obviously may save in future similar studies, two thirds of the labor which the present work required.

III. Recognition of the principle that fundamentally the desirableness of any of the phenomena or accompaniments of living each is measura-

able, and, therefore, interrelatively comparable, only through time units, *i.e.*, only through its anti-longevity effect;

IV. Recognition of the principle that however unequally noxiousness may have been apportioned among the various factors or forces contributory to death, still the aggregate forces which ended, for example after 30 years, the life of any specified individual, must always equal the aggregate forces which ended at the same age of 30 years the life of any and every other individual. Thence through simple algebraic processes of elimination of common factors, etc., suggestive and instructive equations ultimately may be developed, especially when the contributory factors in many thousand lives ended similarly at the age of 30, shall be available likewise for comparison.

A small table, on page 153, of the volume, illustrates how practical and plausible are the tentative inductions that logically may be drawn even now through a modified application of these just-mentioned principles.

Object.

The primary object of this study specifically, however, was to secure essentially accurate age group death rates for the great cotton manufacturing industry. In pursuit of this primary object the investigation disclosed the fact that in the country's largest cotton manufacturing city not even one half of the females who had died two years or less after quitting cotton-mill work were recorded upon the official death certificate as having been cotton operatives.

At the present time, therefore, even in the registration states which are reputed to gather their vital statistics most carefully, the official death records fail to indicate even approximately how many woman cotton operatives die each year, although cotton manufacturing is the foremost industry of the chief of these states and half the workers in it are women. That knowledge of the true mortality statistics of an occupation is an absolute prerequisite to an intelligent formulation of adequate remedial measures seems obvious.

A second and very practical purpose was to point out the true underlying or basic factors or agencies to which the debility or impaired health, which must usually precede death, may reasonably be ascribed.

From the practical standpoint, interest would seem to attach far less to the officially designated causes of death—the so-called diseases—than to the debilitating factors of which the disease may be only the final manifestation. For early recognition of such debilitating and disease-producing factors may render it possible either to remove them or make them harmless by increasing the physical resistance of the prospective victim, who, knowing his danger, may take suitable means to avoid it. Prophylactic or disease-preventing efforts are infinitely more useful than cura-

tive ones. But for the prevention of debility, disease, and premature death, knowledge of their basic causes is obviously an essential prerequisite.

Basis of Inquiry.

The study is based upon transcripts of the official death certificates, furnished in Massachusetts by the Secretary of State, and elsewhere by secretaries of the respective State Boards of Health.

Excepting solely as regards "occupation" and as respects such decedents as had died immediately after parturition, the original data of the official certificate invariably have been used in this initial analysis of anti-longevity causes without any change whatever.

And this, too, despite the fact that in a number of cases in which the physician's certificate gave some such equivocal cause of death, as bronchitis or hemorrhage, or some terminal condition, such as broncho-pneumonia or heart failure or debility, the history of the case when studied showed almost beyond question that tuberculosis had been the real cause.

Method of Securing Data.

To attain these two objects—the correct mortality by age groups in the cotton manufacturing industry and a knowledge of the underlying debilitating factors which might explain this mortality—a personal inquiry was undertaken concerning each individual, aged 10 years or over, who within a three-year period had died from specified diseases or causes within specified cotton manufacturing cities. This inquiry was made at the late home of the decedent and nearly always from a relative, who furnished information also as to the decedent's family, his habits, occupational and conjugal experiences, exposure to communicable disease and other personal facts of possible significance in explanation of his death. Moreover, the investigator personally inspected the premises and made note of certain hygienic conditions which might have been numbered among the debilitating factors which led up to the death.

Reliability of Information Secured.

Owing to the fact that tuberculous operatives showed a tendency to return to their early homes when they were no longer able to work, it is probable that for all the cities studied the number of operative decedents is slightly understated. It is quite certain that there is no overstatement of the number, because no decedent has been classed as an operative unless a definite statement to this effect was made by an informant whose name is on record. The statement on which the occupation classification is based included not only the fact that the decedent had been a cotton operative, but also the name of the mill in which he had been employed, usually, also, the specific occupation at which he had worked, and always

the fact that he had been employed at such mill work within a specified period, not exceeding two years, before his death.

It is obvious that evidence so specific and detailed would not probably be manufactured, especially as the informant had no inducement to misrepresent the facts in either direction. During the course of the investigation an incidental proof was obtained of the general accuracy of the information gained. The inquiry was begun in Fall River. Five months after its data had been secured a change in the scope of the investigation made it necessary to record certain additional data concerning female decedents, which could only be obtained by revisiting the earlier informants. In this reinvestigation, several hundred persons were questioned a second time on points on which they had first given information five months earlier, yet in only two cases was their testimony found to differ from the original statement in any important particular.

"Operative" Defined.

The term "cotton operatives" is used to mean only those persons whose work had been such as to expose them many hours daily to the processes or hygienic conditions peculiar to a mill that manufactures cotton wadding, yarn, thread or cloth. The term has been still further restricted by limiting it to those who were either working in a cotton mill up to the time of death, or who had left it not more than two years before death. This arbitrary limit was fixed upon after consultation with eminent medical men as being probably well within the period during which the effects of mill influences, even if latent while the decedent was in the mill, might yet be considered beyond question as having borne a causative relation to his death. In the course of this study many facts were elicited showing resemblances, sometimes almost to identity, between the class just outside the two-year limit and the operative class. It was felt that this fact gave a strong indication that the two-year old limit erred, if at all, on the side of conservatism, and that possibly a limit of three or even four years, or the inclusion of nearly lifelong cotton-mill workers retired through age, would have been fairer.

Comparative Study of Selected Groups and Classes.

"The age period, 15 to 44 years, was selected for special intensive study because it represents a period of full industrial activity during which the death rate would normally be low.

"A second reason for choosing this age period for special study lies in the fact that more than one-half the entire population is found within its limits, so that it presents a wider field for study than a more limited age group could do. Moreover, for a study of causes of death among cotton operatives, this group presents unique advantages, since more than four fifths (85 per cent.) of the entire operative population is included within

it. Also within its limits are found three fourths (76 per cent.) of the entire number of tuberculous deaths of individuals aged 10 years and over, nearly three fourths (73 per cent.) of the whole operative mortality from all causes; and fully nine tenths (91 per cent.) of the entire operative deaths from tuberculosis."

Evidently any specified cause or disease is important just in proportion as it is active among the country's producers and its reproducers—its workers and its child bearers. And since the child bearers are almost wholly, and the workers very largely, found within the age group 15 to 44, the different causes of death challenge attention and call for remedial action in proportion to the share of their victims they draw from this group. Hence the question of foremost importance to be answered concerning a specified disease or cause of death is not: "How many deaths are ascribable to it?" but, rather, "Are most of its deaths within age limits that embrace the bulk of the productive population?"

So, finally, tuberculosis was selected for intensive study because it was found to be the most prevalent ultimate or immediate cause of death within the age period 15 to 44, which comprised one half the total population and four fifths of the operative population of the cities selected for study.

Method of Estimating Significance of Contributory Causes of Death.

There are certain circumstances or experiences, common but not inevitable accompaniments of living, which may be active factors in the causation of both disease and death. Such, for instance, are (1) bad heredity; (2) ignorance; (3) bad air, whether germ laden, dusty, humid, or chemically impure; (4) bad food, that is, ill chosen, ill cooked, or ill chewed; (5) bad or alcoholic drink; (6) bad personal, sexual, or apartment hygiene; (7) long labor and short sleep; (8) occupational stress (hurry and worry); (9) scant income, whether through thriftlessness, misfortune, or low wages; (10) accompaniments of the conjugal condition, such as childbirth and dependents; (11) overwork or non-resiliency from fatigue. These or some of these conditions might be encountered in the life history of any decedent, and it has been assumed tentatively that the significance of any such condition as a causative factor of death is established by the frequency with which it was found to have occurred as an antecedent of the deaths studied.

For example, the following study shows that in Fall River 29 per cent. of the decedent female cotton operatives had had tuberculous relatives, while only 21 per cent. of the decedent male operatives had had similarly affected relatives. In accordance with the above principle it has, therefore, been tentatively assumed that tuberculous kindred have more influence as a causative factor of deaths among female than among male operatives.

Again, the economic importance of any factor or group of factors is

measured fundamentally by its longevity effect; *i.e.*, its effect on the duration of life. In this study it has been tentatively assumed that this effect is shown by the rare occurrence of a given factor in the life history of young decedents, or conversely by its frequent occurrence in the life history of those who attained a high average age before death.

For instance, it was found that in one of the cities, during the three years covered by this study, four fifths (79 per cent.) of the total number of deaths from tuberculosis among the female population aged 10 years or over occurred in the age period 15 to 44, while of the deaths in the same age and sex group from pneumonia and cancer less than a third of the first and one quarter of the second occurred in the age period 15 to 44.

In other words, tuberculosis had a far more marked anti-longevity effect in this group than either of the other diseases. But this period is that of the greatest industrial importance. It is evident, then, that so far as this section of the population is concerned, tuberculosis, which finds its greatest number of victims in the period of chief industrial activity, is economically far more important than pneumonia and cancer, which find their victims principally among those whose industrial effectiveness is either waning or practically at an end.

Basically each life experience is bad in proportion to the extent that it shortens life. It is only, therefore, by a comparison of the ages at death of individuals whose lives were characterized by specified experiences that the relative effectiveness of these experiences in ending life can be determined.

This method of reaching conclusions as to the physical condition of a specified class of individuals by a comparison of accurate death rates has been so seldom mused and differs so radically from the customary method that the main points of variance between the two modes of investigation need some consideration.

Advantages of the Death Rate Over the Inspection Method.

First of all, these two methods differ widely in the sharpness with which their basic terms may be defined. For the term death has a precise significance and is unqualifiable; whereas the term debility, ill health, or disease is inexact and qualifiable. Moreover, the unit of the one measure, death, is a demonstrable fact, while the unit of the other, ill health, may not be susceptible of demonstration. The one is absolute, the other only relative. And finally death is fixed and unchangeable, whereas ill health is variable.

Secondly, the death-rate method has a great advantage over the inspection method in the possibility it offers of isolating a given life experience—as, for example, cotton-mill working or tuberculous infection, from other life experiences or circumstances, and for determining its relative probable

power for harm, or anti-longevity effect. For this purpose the unit of the death-rate method—an individual dead—is worth immensely more than is the unit of the inspection method—an individual debilitated, ill, or diseased.

For when it is said that a given number of individuals at a certain age are in ill health or diseased, it is impossible to say how much injury any one of them has suffered or will suffer from the ill health or disease by which he is affected. His physical condition is the result of a number of factors acting in combination. It might conceivably be possible to learn every one of these factors, but as there is no way of measuring definitely the amount of harm they have accomplished in combination, there is evidently no way of determining the amount of harm for which each is responsible. Together they have brought about a general condition known as ill health, or perhaps some specific condition such as tuberculosis or typhoid fever, but the inspection method affords no way of learning what either the general or specific condition means in years of life sacrificed or industrial efficiency lost.

But when it is stated that a given number of individuals of a designated age have died, it is evident that each one of them has suffered the greatest total physical injury to which any individual of that age is susceptible. The factors which have produced death at the specified age undoubtedly differ widely from case to case in number, in identity, and in individual harmfulness, but in every case their combined effect has been the same—death within a specified age period. Knowing, therefore, their combined effect, it becomes possible to determine with some degree of accuracy the relative degree of harmfulness of each factor.

Another very marked advantage of the death rate method as used in this study is the opportunity it offers for comparison between occupational groups, or between those in one occupational group and the general population. Thus, in the present case, concurrently with the investigation into the underlying causes of death among cotton operatives, a corresponding investigation was conducted into causes of death among the non-operative decedents within the same age period. To show the value of such comparative statistics in investigating health and longevity problems, let it be supposed that the data so collected show two groups of married female decedents of essentially equal physical and mental hereditary endowments and of essentially similar life experiences, except that those of one group were engaged in cotton-mill work for the fifteen years next but two preceding death, while those of the second group were engaged in housework at home for the same period. Let it be further supposed that each of these decedents had been exposed to tuberculous infection through a consumptive member of her family, and that all died of tuberculosis,

the cotton-working group at the average age of 30, the home-staying group at the average age of 40 years. These contrasting occupational groups might then be said to constitute a vital experiment—infection—performed under conditions, *i.e.*, vital experiences, seeming to differ in but one material circumstance, the conditions of work. The difference of ten years in length of life might logically, therefore, be attributed to that one circumstance.

An added advantage of the death-rate method is that it has to do the more with malign influences. For as psycologists, alienists and criminalogists through study of the grossly abnormal in child and adult are discovering the basic laws of mind; and as anatomists and pathologists through dissection and microscopic examination of the cadaver are discovering the basic laws of surgery and remedial medicine; so analogously, students of prophylactic or preventive medicine should find analysis of life experiences and circumstances of the dead, rather than of the sick, the more prolific in conclusive results or disclosures concerning the basic laws of health.

The possibilities of logical inductions (or colloquially, of common sense reasoning) surely to follow from use of the unit of the death rate method in securing the isolation of a suspected anti-longevity factor and in the subsequent rough measuring of that factor's destructiveness to life, as well also as in comparing its own malignity with that of other anti-longevity forces, have been demonstrated in the following small "key-note" table on page 862.

A comparison of the average age at death of the three classes included in this table shows that among female decedents in Fall River who had been mothers, tuberculous operatives died at the earliest age. These also had borne the smallest number of children per decedent mother, and showed the largest percentage of deaths among these children.

Next in average age at death came the non-tuberculous operatives. These showed a moderate degree of child bearing and a moderate mortality among the children produced.

Finally came the tuberculous non-operatives. These showed a moderate degree of child bearing and the smallest percentage of deaths among the children.

Inductions.

The fact that it averaged eleven years less time for the factors in Class I, than for those in Class III, to produce a bodily state fatally vulnerable to tuberculosis, points to cotton-mill employment rather than to prolificacy as having been by far the more important causative factor in the death of married Fall River females in 1905 to 1907.

Likewise, Classes II and III would seem to indicate that cotton-mill employment unhandicapped with tuberculosis was basically a weightier factor in fatally terminating motherhood than was absence of operative work even complicated with tuberculosis.

Moreover, the fact that it required eight years less time for the factors in Class I than for those in Class II to effect a fatal result emphasizes how great a life-shortening factor tuberculosis is and what social and economic loss it occasions.

However few the children, therefore, motherhood conjoined to cotton-mill work in Fall River constituted a combination of duties that was prejudicial to child life; and conversely for Fall River female decedent operatives of 1905 and 1907, any extra work outside the mill including the

COMPARATIVE FREQUENCY OF INCIDENCE OF DESIGNATED FACTORS AMONG SPECIFIED CLASSES OF FEMALE MARRIED DECEDENTS IN FALL RIVER DURING 1905 TO 1907, TOGETHER WITH THE RELATIVE LONGEVITY OF SAID CLASSES.

Age group 10 years and over.	Specified debilitating factors.					Casualty and infection.	Average longevity effect.
	Work.	Average prolificacy.	Average percentage of children dead.	Miscellaneous factors.	Resultant effect.		
Class I.—Tuberculous operatives (55).	Exclusively industrial.	Minimum.	Maximum.	(?)	Profound debility.	Tuberculous.	Death very early (age 30); brief illness.
Class II.—Aggregate nontuberculous operatives (118).	do	Next to minimum.	Next to minimum.	(?)	do	Minimal	Death less early (age 38); illness briefest.
Class III.—Aggregate tuberculous nonoperatives (66).	Minimally industrial.	Moderate.	Minimum.	(?)	Moderate debility.	Tuberculous.	Death least early (age 41); illness longest.

care of children, however few, constituted a seemingly debilitating influence that in the average case, even in the absence of tuberculous infection, was inimical to maternal longevity.

Summary of Specific Results.

These are some of the salient points brought out in the study, as disclosed by the report.

I. The effect of cotton operative work upon health, as reflected in the death rate, differs widely between the sexes. For the thirty-year age period

from 15 to 44, in which the great majority of the operatives are found, the death rates of males and females in the general population are almost identical, the male rate being 6.19 and the female rate 6.18. A comparison of the death rates of male and female non-operatives shows the rate for males to be 22 per cent. in excess of that for females (male rate, 6.48; female rate, 5.31). When, however, the comparison is confined to the death rates of operatives the female rate shows an excess of 33 per cent. over the male (male rate, 5.74; female rate, 7.63) despite the younger ages of the female operatives.

II. For the population aged 15 to 44 as a whole, and for every 5 year age group subdivision except two, the situation as to racial mortality may be thus summarized: Of all the races and peoples, the Americans exhibit considerably the greatest, and the Irish the least, physical resistance to fatal influences, the former having been about one-third less and the latter about two-thirds more liable to die from "all causes" than the general population: the English were about one-quarter less liable to death than were the individuals of all races on the average; and finally the French Canadians exhibit slightly less and the "Other races" slightly more than combative resistance to death than is shown by the average of individuals of all races.

III. In the age groups within which operatives and non-operatives are fairly comparable, female operatives have a decidedly higher death rate than non-operatives. This is most marked in respect to tuberculosis, the death rate of female operatives from this cause being in general more than twice that of non-operatives, and in some of the race and age groups running up to many times as high. Thus, in the age groups 15 to 24 years, 25 to 34 years and 35 to 44 years, the death rates from tuberculosis per 1,000 were, respectively, two and one-fourth times, two and one-half times, and five times, those among women of the same age groups outside the cotton industry. Furthermore, as respects males of the aggregate non-Irish races, comprising about six sevenths of the total male population aged 15 to 44, male cotton operatives were slightly, though constantly, more than were male non-operatives liable to death from "all causes," and they far exceeded non-operatives in death hazard from tuberculosis (in Fall River, three years, and three cities one year, excess 74 per cent., 81 per cent.).

IV. Of great importance is the demonstration that at no age were individuals embraced within this study even moderately free from the liability of death from tuberculosis. For even among the obviously largely non-industrial senile population aged 65 years and over, its prevalence was fully one-half (1.61) what it was in that age group, 30 to 34, within which its ravages were greatest (3.19), and in which industrial activity is commonly supposed to be at or near its zenith.

In short, it was found that even numerically as inadequately reported officially as was characteristic of the years 1905–6–7, tuberculosis was yet the certified cause in age group 15 to 44 of one out of every two operative deaths approximately, and one out of every four deaths of non-operatives of both sexes and all races (per cent. tuberculous in Fall River 1 and 3 years, three cities one year—operatives 46, 44, 45—non-operatives 32, 37, 29).

The showing that intemperance in the use of alcoholic beverages had been a characteristic of those classes of males especially that had had the highest death rate from tuberculosis—viz., of the male non-operative Irish, and of the male operative Irish and non-Irish, and most striking of all, of the employees in the liquor trade—brings together coincidences that logically suggest the induction that habitual over-indulgence in alcoholic beverages is a debilitating factor of great weight in the causation of deaths of males from tuberculosis.

Stress—hurry and worry of work without rest intervals sufficient to assure normal resiliency after fatigue (that is, overwork in industrial establishments)—is with the possible exception of infection, the most important etiological factor noted in deaths of women from tuberculosis.

An examination of other factors which might effect the death rate, especially from tuberculosis, such as native or foreign birth, tuberculous kindred or intimates, overcrowding, sanitary condition of homes, etc., fails to show any such massing of unfortunate conditions among the female operatives as would explain their unvarying higher death rate.

Hence it seems impossible to escape the conclusion that operative work is prejudicial to the health of females, that the combination of operative work with matrimony is especially harmful, and that, while the general hazard of the female operative is greater than that of the non-operative, she is in most danger from tuberculosis.

Whether the harmful effects of operative work are greater than those of other industrial employments, and whether they inhere in cotton textile work as a whole or are due to certain occupations carried on within the mills, are questions for further investigations to answer, and the U. S. Bureau of Labor Statistics is engaged now in one such study. This inquiry, however, has established the fact of the high mortality among female cotton operatives and of their special susceptibility to tuberculosis.

In considering the real significance of these conclusions, weight must be given to the character of the death records on which they are based. This study has clearly established that such records, as at present made out. can not safely be used as the basis of mortality studies without investigation of their accuracy.

Registration Errors.

Very incomplete in every city investigated was found to have been official registration as to the occupation upon death certificates. More than one half (51 per cent.) of the female, and over one quarter (28 per cent.) of the male cotton operative decedents, of Fall River during three years, the inquiry disclosed, had been omitted from official certification as having been cotton-mill workers.

The study furthermore discloses that an astoundingly large percentage of those whose deaths were found to have been due to childbirth either primarily or secondarily, had been officially so recorded as to give no intimation that parturition had been a factor in causing death.

And finally a like disingenuousness or design was found evidenced in regard to erroneous registration of tuberculosis under meaningless or grossly misleading designations which gave no hint that tuberculosis had been a factor in the case.

But, however successfully this pioneer work of the Government has accomplished its avowed purpose, "to gain full information upon such points in the occupational and personal history of every decedent operative as might bear upon his length of life, the immediate cause of his death, and any contributory causes thereof;" and however valuable undoubtedly the specific results of the investigation may be, even though at present they may not all be comparable equitably with the uncorrected death data of industries other than cotton manufacturing, still in the author's opinion they all, nevertheless, in importance and real utility are but secondary, as compared with the *system* this study has developed as a method most likely to bring out basic *incontrovertible facts* regarding health conditions within any specified industry or community, to *identify anti-longevity* causes therein; and to *apportion and measure*, at least roughly, the harmfulness rightly ascribable to each such life-shortening force.

Discussion.

Vice-President W. T. Sedgwick: The book which is now passing around the room is Doctor Perry's report, and as it was based very largely upon personal investigations of conditions in Massachusetts it seemed proper that we who have so much interest in Massachusetts industries and Massachusetts health should take cognizance of it. It is quite impossible to follow everything from his verbal statement, but copies of the report may be got and studied at leisure. You have heard his main results as he stated them toward the end, one of them being the excessive mortality of women operatives—raising the question whether, after all, this industrial life of ours which puts woman in the mills under unwomanly conditions, as some of us regard them, is beneficial. Racial considerations, too, are important. The more newly arrived races seem the more susceptible to this particular disease, which is perhaps to be expected; but we may hope that, as time goes on, selection and acclimatization may strengthen all races coming to our shores, so that they can endure the somewhat untoward conditions which seem to prevail, perhaps necessarily, in our modern industrial

establishments. At least, they prevail today, but whether it is necessary that they should continue to prevail is certainly a question.

DR. KENNEDY: I would like to ask a question of Doctor Perry. First I will state what we have in our minds down in New Bedford. We have a great cotton center, the greatest center for fine cotton manufacturing in the United States. I believe it is second in cotton manufacture in the United States, next to Fall River, either second or third. If there is a lot of tuberculosis in mills, would it not be advisable to ask each manufacturer to employ a physician to go through his mill or mills to detect tuberculosis in its incipiency and begin your education then and there? That is one thing that we have considered in New Bedford, and the only thing we are waiting for is a settlement of the tariff question. When it is settled we are going to agitate that. Now, if that is proper, I would like to know it, and if it is not, put us on the right line. Since I have suggested it in New Bedford we have had pointed out to us a concern which has a lot of tuberculosis. We intend to put people in there, not from the board of health but from a private organization, tell them that there is something wrong and ask them if we cannot go through and find out what is the matter, and point out to them what they should do. Now, we don't propose to put the people out of business. It does not mean that every operative who has tuberculosis in its incipiency shall be put out of a job, but to educate him to look out for himself and to educate his near worker to look out for himself. I would like to ask Doctor Perry if that is right. In New Bedford we have considered infant mortality, and we have a priest, who has talked to his people and told them how to bring up their children, and he has talked to the mothers and the near mothers, and he has provided a fund to let the near mothers loaf for a while, so that the child may be brought into the world. Now, I am convinced that that is a good thing, and what would you suggest to better it, because we never get to the best of it?

DR. PERRY: Any action whatever that shall result in early recognition of tuberculous cases obviously has merit. I can see no reason why an inspection of cotton operatives performed in the mill by competent physicians should not result in the detection of at least some cases of tuberculosis in their incipiency, and thus prove advantageous.

As I have just described, the problem in which the United States Bureau of Labor Statistics has been, and is now, engaged is to furnish the *facts* concerning the real death hazard of wage-earners of specified age. To show, for example, just how much fatal tuberculosis exists among female cotton operatives, aged 15 to 44. After the Federal Government has pointed out the extent to which deaths from tuberculosis are common to cotton operatives, it is entirely logical for health officials of cotton manufacturing cities thus to bestir themselves in devising means to check its ravages. Doubtless there are other industries that, upon similar study, may prove to be even more hazardous as respects tuberculosis than is cotton manufacturing. I hope there are not, but I rather suspect that there are—file and stone cutting, for example, and other occupations in which mineral dust is a factor. As yet cotton manufacturing is the only industry the correct death hazard of which has been established. Therefore, any exact comparison of the mortality of industries is at present impossible.

I shall be much interested to learn just how effective in curbing tuberculosis this suggested scheme of the member from New Bedford proves. It seems emphatically worth trying, even though not every case of tuberculosis among the operatives may be expected surely to be discovered thereby. As many as are recognized, however, so much to the good!

AN EXPERIMENT IN PUBLIC HEALTH ADMINISTRATION.

EARLE B. PHELPS,
Massachusetts Institute of Technology.

Read before the Massachusetts Association of Boards of Health, July 31, 1913.

The problem of board of health administration in the towns and villages is largely a financial problem. The important matters in city health work, such as the isolation and care of the sick, school hygiene, the milk supply, housing and factories, general cleanliness and the rest are all primarily due to or aggravated by the concentration of population. In the small community the control of these matters is relatively simple. Given a sufficient appropriation and a live health officer, there is nothing to prevent an ideal situation.

But the very factors which make for this fortunate situation bring with them a compensating disadvantage. There is in each such community a little work of each kind to be done; a little milk inspection, a little diagnostic and laboratory work, some plumbing inspection, a few nuisances, etc. Moreover this work, although small in amount, is of so diversified a character that its proper handling requires a certain amount of expertness in the several lines. No one will contend, I believe, that the same person can properly inspect plumbing and also examine suspected diphtheria cultures. Specialization is as necessary here as in the case of the cities, and a group of workers corresponding on a small scale to the organization of a city board seems to be the first essential requisite. The process of subdividing, however, reaches a natural limit in a group of three or four specialists and the cost of even such an organization in the case of a small town is entirely disproportionate to the needs.

It seems a logical solution, therefore, since we cannot further reduce our organization unit, to increase the size of the community unit by cooperation among several towns. This, in fact, is the only apparent solution, short of state or county control; for no one will contend, I hope, that the method prevalent in Massachusetts of entrusting the health work of the town to the inexpert hands of local physicians and business men is any solution at all. No matter with what degree of public spirit, enthusiasm and personal sacrifice such men undertake their duties, their work compares with the work of an efficient organization much as the work of the old volunteers compares with that of a modern fire department.

Let us now consider the details of an experiment in public health administration which has been built about the two principles which I have outlined here—specialization and coöperation.

The Board of Health of Wellesley had for three years previous to last fall employed a trained man, Mr. C. K. Blanchard, to give his whole time to the duties of agent of the Board. In November Mr. Blanchard accepted a position in the New Jersey State Board of Health and thus created the immediate opportunity for putting into effect a program which had been previously mapped out by Professor Sedgwick and some of the officers of the Department of Biology and Public Health of the Massachusetts Institute of Technology. This matter was taken up with the members of the Wellesley Board who were immediately interested and who later appointed the speaker general agent of the Board with power to organize a small administrative unit. This agreement was to run for six months to allow time for the extension of the idea. The funds that had been available for Mr. Blanchard's services were placed at our disposal and it was understood that department or personal funds would be used to make up any deficit.

It was realized at the outset that coöperation would never be brought about by mutual agreement among the towns. The question of the proper division of the expense and of the service would involve the whole project in an endless and fatal discussion. We were after results and we went to each town, explaining the coöperative nature of the undertaking but making a definite individual offer of so much service for so much money. There was necessarily a good deal of bargaining, and we had to meet existing conditions of finance and needs so that our financial arrangements are perhaps not quite equitable and not thoroughly business-like. By April first six communities had accepted this service in whole or in part and later two others came in. The list at present in the order of participation, is Wellesley, Belmont, Framingham, Weston, Needham, Melrose, Winchester, Canton.

In Melrose and Canton only the milk inspection has been placed in our hands and in Winchester we merely do the laboratory examination of the samples collected by the milk inspector. In the remainder of the group we perform all the administrative work of the board of health, except that in some towns the plumbing inspection is not included in our agreement.

Each town makes a definite appropriation for the year's work and enters into a contract with the general agent for stipulated services at a fixed lump sum.

The total appropriation amounts to about $6,300 per annum. The population served is approximately:

For milk inspection, alone,	25,000 additional
For general administration (including milk inspection),	30,000
Total,	55,000

We have thus brought about the first requirement of our program and built up a community unit which is big enough to support our minimum organization.

The organization itself comprises an administrative officer, who acts as agent of the several boards, a chemist and bacteriologist, responsible for the laboratory work, a plumbing and sanitary inspector and the necessary clerical and laboratory assistants. There is also the general agent, responsible for the business relations, and matters of general policy, whose services are given to the organization by the Department of Public Health of the Institute. This is the minimum unit for efficiency. With it we can bring expert treatment to bear upon almost any question which may be raised. It is not, however, the most economical unit. By the employment of assistants at a 60 per cent. increase in cost, the output could be doubled and no efficiency sacrificed.

A central office and laboratory is maintained at Wellesley where the laboratory originally installed by the Wellesley Board has been reëquipped for its broader service. An automobile and a motor cycle, together with the telephone, make rapid communication possible. Definite office hours are maintained in the larger centers either by one of our own staff or by a town official whose duties permit him to act as resident clerk to receive complaints and mail and communicate them to the central office. To conform with the law, the various Boards appoint the members of the staff, as their agent, milk inspector, plumbing inspector, bacteriologist, etc., but the organization pays the salaries and running expenses and the agent is responsible for all results. He reports monthly to the Board in writing with a detailed account of all his work.

Culture stations are located at central points at which supplies of media and diagnostic outfits of forms, etc., and of the various state board supplies (vaccine, antitoxin, etc.) are kept. At certain of these stations also portable incubators are maintained so that throat swabs deposited previous to midnight are reported upon the next morning. Positive diagnoses for diphtheria and typhoid are reported at once by 'phone.

The laboratory with its complete equipment for diagnostic work of all kinds under the supervision of an expert diagnostician and the facilities for prompt reports upon this work comprise one of the most valuable features of the service.

The milk supply of each town is examined chemically and bacteriologically once a month. The results are reported to the dealers promptly and to the Board with the agent's monthly report. In the majority of the towns the results are also given to the press and in all cases the records are on file at the local office and may be inspected by the public. We consider this publicity a most valuable feature in controlling the quality of the milk. With it we believe we can safely do away with arbitrary

legal standards. If the facts are placed before the consumer, self-protection forces the dealer to improve or drop out. Instead of trying to evade the law and looking upon the milk inspector as a necessary evil, he now comes to us voluntarily for advice and—what is more important—does what we suggest. We place little reliance upon inspection for we cannot inspect proper behavior into a milkman who has no incentive to behave. We do, however, familiarize ourselves with conditions, especially when the analysis shows them to be bad in order to properly advise the producer. We are working on the theory that the laboratory examination of milk is the primary board of health function. It shows us what we are getting. Inspection of dairies is a duty we owe to the farmer if he desires to profit by such inspection.

It was intimated at the outset that this problem of board of health administration is primarily a financial one. There is nothing new in our work; any one can do it with proper funds. The important and novel feature is to give this expert work to towns at a cost which makes it possible for them to take it up. An important matter, therefore, is the accounting. We are maintaining an up-to-date cost-keeping system and know to a penny what each kind of work costs. Even our auto mileage is charged to the various items of work and at the end of the year the costs will be assessed on our books against each town and a profit and loss balance struck, upon the basis of which the costs for another year can be definitely adjusted and new work taken on. Our purpose has been to render the service at cost with no charge for the department oversight, which Professor Sedgwick has generously provided for. At the same time the organization must be self supporting and should show a comfortable reserve for contingencies.

The work is experimental then in a financial as well as a political sense. After April first, 1914, it will remain for the towns to decide whether or not they wish to continue the arrangement. Whatever may be the outcome of that decision, whether the organization shall be enlarged to take in a wider circle, which it can do with additional economy, or shall complete its work and disband, the experiment will have demonstrated the feasibility of this type of coöperation, the satisfactory nature of the service thus made possible and the remarkably reasonable cost of this sort of expert public health administration.

Discussion.

Vice-President W. T. Sedgwick: I ought to say that Professor Phelps gives a good deal more credit to me and to our department at the Institute than we deserve. It is he, as the representative of that Department, who has done all this and has made it possible. It has been his persistence, his tact, his far-sightedness, which have initiated and carried on this most interesting experiment. The rest of us have supported him and looked on; that is about all. The truth must be told.

MR. R. N. HOYT:* I think there are two sides of this very interesting problem. There is a side which may appeal to the communities that we serve, of bringing to them something from outside, something new, but we are also finding that this is twofold, it is bringing to us a great deal. In each community some particular line of work is more developed than it is in other communities. That gives us a chance to do in that community something experimental, which can be carried to the other towns, and I have found that personally very helpful. In one town we can develop milk inspection to an especially high degree. The experiments which we try in that town are very useful and can be applied in other towns. The line of publicity appeals more to one town than it does to another, and we find that developing that idea in one town, finding what really does appeal to the public, what kind of publicity brings results, we can apply that lesson in other towns. And so in many ways we are finding in this community organization, this organization which comprises several localities, a chance to do experimentation in one town that shall be applied in these other communities.

PROF. C. E. A. WINSLOW: I should like to say a word about Professor Phelps' paper. I cannot quote Doctor Anderson's words, but he stated, it seems to me, today the whole matter in a very complete way in one sentence when he said that the problem of the health officer, national or local, was to get enough money and then to spend it wisely. That was the effect of one of his sentences; but, of course, it is not altogether an easy thing to do. We have come during the last five years to a period of heart-searching as to the most efficient methods,—particularly of spending money for public health work.

I had an interesting experience just about a year ago in the study of the local health situation in the city of Minneapolis, to take the case of a large city. There the civic bodies became interested in an attempted reform of the health department, and called Doctor Biggs, the chief medical officer of New York City, and myself, to make a scientific management study of the health department. We studied the various activities, the control of communicable disease, facilities for hospitalization, control of the food supply and the milk supply, particularly methods of disinfection and so on, and we arrived at results which were at first very disappointing to the civic bodies, who expected an attack, or an exposure of the inefficiency of the health department. We found, without going into details, these two outstanding things: First, that Minneapolis was appropriating the smallest amount for public health service, something like 15 cents per capita, of any of the large cities in its class, against appropriations of over 50 cents for Boston, New York, Newark, New Orleans, and amounts ranging down to Minneapolis, about 15 cents. We found that the particular lines of health department activity that were most neglected there were the ones that had the most inadequate appropriations, that whereas, for example, New York was spending 5 cents per capita for school inspection Minneapolis was spending about half that amount, that while New York was spending 2 cents for infant mortality work Minneapolis was spending practically nothing for that purpose,—I mean through the official health department, and throughout that the appropriations for the most important public health activities were the ones that were the most inadequate. In the second place, we found that the health department was a department of the city council, that all the employees of the health department were appointed once a year by a committee of the council, that the ordinances were all drafted by the council. At that time they had been working for years under a milk ordinance which provided that all the milk of the city should come from tuberculin-tested cows. That, of course, made any attempt at even a milk-license system impossible, and they could not get that ordinance changed. At the time we were there, there was a serious outbreak of rabies, and a muzzling ordinance was referred to a committee of thirteen aldermen, a month before election. So that our conclusion was that although the health department was inadequate in many respects it was a great deal better than the city deserved, in view of its faulty or-

*Administrative Agent of the Cooperative Organization.

ganization and its inadequate appropriation, and that was a surprise, and threw a good deal of light on the situation to the local people.

With a large city it is possible by proper legislation and proper appropriations and with the right men, to get the work done in splendid fashion, to get results such as have been obtained, for instance, in New York City, where the administration of the local health department is an inspiration to any one who can study it; but in the small town there has always been a more serious difficulty. It has been the difficulty that Professor Phelps has so well stated, that the small town cannot afford to pay for the various kinds of expert advice it needs. This difficulty is being met in different parts of the country in various ways. We have just met it this spring in New York state by a very drastic and far reaching law which abolishes the local board of health entirely, keeping the local health officer and placing him under a district sanitary superintendent, who is in turn under the state department of health. This is not a method which, from what I know of the spirit of Massachusetts, is likely to find favor in this state. It is particularly fortunate, therefore, that you have had worked out here this experiment so full of promise, so in harmony with the spirit of Massachusetts. The small town cannot solve this thing alone, and as I say, I think it unlikely that the town in Massachusetts will care to give up its powers to the state, but it can meet the difficulty by coöperation. It seems to me this idea put in practice in this way is one of the most hopeful things that has ever happened for the cause of local health administration. Ours is a period of experimentation in health organization. That title pleases me particularly. The fundamentals of public health science have been worked out in many lines now, so that they can be applied satisfactorily. We have got to experiment with organization, putting them in practice. You know they define an efficiency engineer as an engineer who is out of a job, and, of course, there is a good deal of danger in all this sort of thing. That is why the good efficiency engineers prefer to call their science scientific management. We need scientific management applied to health department organization. It is a great thing to see that it is coming. It is a great thing to see that the Massachusetts Association is carrying on its good work of leadership in this line.

Dr. J. F. Anderson: I think that this work that Professor Phelps has referred to is really one of the most important things that has been brought out in public health work for a long, long while. The efficiency of public health work after all is a local problem. You have got to have efficient local health officers. Why, take even our vital statistics. We have a bureau of census which collects certain vital statistics, the public health service itself collects and publishes certain morbidity statistics, but after all we are absolutely dependent upon the local people for these statistics. And it is the same way whether we have a department of public health or any other federal department, after all it is a local problem, and the furthering of such work as Professor Phelps has referred to here this afternoon in my mind is one of the most hopeful indications of what we may expect in the near future.

Dr. M. J. Rosenau: I will be brief, although there is much that I am tempted to say; and I think you will agree with me that it is an act of considerable self-restraint that I refrain from discussing Doctor Anderson's splendid paper, which to me was very much like a twice-told tale admirably told. You may not know that for twenty years I participated in many of the activities that he told us about this afternoon. While I am on my feet, however, I want to say a word about the remarks that Professor Phelps has favored us with this afternoon. I do not agree with what Professor Winslow has said, that Professor Phelps has chosen an attractive title to his paper. I do not believe that this is an experiment, I believe it is an accomplished fact, and I believe it is one of those things in coöperation which is not only going to extend throughout Massachusetts but neighboring and distant states and foreign countries. We all know that the weakest link in the sanitary chain is the country, and it is the country that must be reached in order to prevent infection spreading and flowing to the city. One cannot go to any meeting, whether medical meeting, sanitary or hygienic

congress, philanthropic association, or uplift society of any kind today, at which one does not hear that keynote word, coöperation. We almost grow weary of the reiteration and sometimes feel that it has been overworked. But after all it is necessary: coöperation, not only between Federal Government and state, and between state and local authorities, and between local authorities and the people themselves, but coöperation between all the agencies concerned, one and another interlocking in helpful ways. It must be perfectly evident to anybody who is at all familiar with the situation, that the real work in preventive medicine rests with the people themselves, guided by the local health authorities; furthermore, that sparsely settled districts and small communities cannot effectively and efficiently apply all the modern scientific methods, which are sometimes expensive and cumbersome, and which requires experts that cannot be supplied by each little township. It, therefore, requires the kind of coöperation and concentration of effort which Professor Phelps has so ably and so well described, and which he has so efficiently put into effect. The principle is not new; we have had coöperation in Metropolitan water supplies, in sewage disposal, in school, police, fire and other things. It now is time to apply the same idea to health. Professor Phelps modestly says that the credit and honor belongs to Professor Sedgwick. Perhaps it does. Professor Sedgwick in turn turns it over and says it belongs to Professor Phelps. Perhaps it does. So far as I am concerned, it may belong to both of them, for I think there is enough in the proposition, that is, enough honor, for all.

JUDGE NOT, THAT YE BE NOT JUDGED! DOES THE AMERICAN FEDERATION FOR SEX HYGIENE SPEAK THE TRUTH?

ROBERT N. WILLSON, M.D.

Secretary, American Federation for Sex Hygiene.

In the July number of the AMERICAN JOURNAL OF PUBLIC HEALTH appeared an article that called into question not only the accuracy, but seemingly the honest intent of the very few figures and statistics displayed by the American Federation for Sex Hygiene in its exhibit in connection with the International Congress on Hygiene and Demography. It is not quite clear whether the writer of the article aimed at perpetrating a bit of literary buffoonery or whether he really intended his effort as a serious criticism of honest men who have an honest, and a purely philanthropic purpose in view. Were it not for the fact that the article is only partially personal in its combined use of a semi-maudlin levity and a covert venom, it would merit in reply only a dignified silence. Inasmuch as the desire and intention of the Federation to present accurate facts and figures to the public is publicly impugned, and inasmuch as our critic has recently held, however improperly, so prominent a position as that of Secretary-General of an International Congress on Hygiene the matter at once loses its personal nature, and forces upon the Federation the necessity of a reply both as an obligation to itself and a duty to the public.

Not long before the death of the president of the American Federation for Sex Hygiene, Dr. Prince A. Morrow, one of a series of unnecessarily discourteous, almost boorish communications, addressed to the Secretary of the organization by the said Secretary General (all bearing upon the facts and figures criticized in his recent article) was brought to the formal notice of the Executive Committee. Doctor Morrow and the present writer were both in attendance upon that meeting. Both had had an active part in the preparation of the Federation's exhibit, which, it may be remarked, approved itself to the Committee of Awards to the extent of warranting them in conferring a Certificate of Superior Merit (the highest award of honor) for two out of three portions of the exhibit, the latter of the two containing the data which have so exercised the Secretary General as to bring about the loss of his sense of professional courtesy, if not also of his reason, for the time being.

Both Doctor Morrow and Doctor Willson had experienced at first hand

the unwillingness or inability of the Secretary General to adopt either a tolerant or an intelligently conservative view of the Federation's attempt to inform the public with regard to the facts and figures that are their due. At least one other member of the Executive Committee knew the Secretary General in person. His communication was received in a dead silence, broken finally by the now departed chief, who simply said, "Gentlemen, I think we need not pay any attention to this communication."

There was no further discussion of the subject. At the close of his recent semi-frivolous article the same Secretary General says of Doctor Morrow, "Search his writings for the manifestations of a cynical, fanatical or mysterious mind, and you will go unrewarded." He will, therefore, no doubt, in accordance with this sentiment cheerfully accept Doctor Morrow's quiet, orderly estimate of his worth as a critic.

So much by way of simple comment upon the equipment of this one-day a municipal office holder, now a Secretary General, and once more an appointive health officer,—ever a doctor of fortune rather than of medicine or science, who rather discourteously and altogether unprofessionally takes both the Federation and an investigator and social worker, albeit a practising physician, to task for a series of approximate facts and figures, at least an important portion of which he (the Secretary General) still holds impounded in the Government printing office, and which, though he criticises them in public, he has not yet given the public the opportunity to read in their proper context. There is needed hardly the further statement that when the proof of the original article quoted and referred to by the Secretary General was received by its author it had been so mangled and its sentences had been so rudely transposed ("in the printer's office," he was told) as to be unrecognizable and impossible of reconstruction except by replacing the galley with new manuscript. Figures misplaced and misquoted, sentences out of place, whole paragraphs inverted, and yet absolutely no one cognizant of the manner or method of the occurrence. A corrected proof was then promised in a personal note from the Secretary General, and when four months later (August 1) a request was made for the same, the reply was made, "I remember very well the extraordinary jumble into which your paper got, and I can assure you its proper order was restored." But still no corrected proof, and, instead, the *quasi*-criticism of its contents, not yet delivered to the public.

There are merely two points to which reply shall be vouchsafed, and to these, as already stated, for the sake of the public, not for my own gratification or because I personally feel that recognition is due such a critic.

I. Are the figures bearing upon American expenditure upon immorality and prostitution essentially correct, or are they not?

II. Is the estimate of the number of public prostitutes in this country,

as given, indeed— ultraconservative, or at least well within the limits of conservatism, or is it not?

If an affirmative answer can honestly be given to both these queries then let us forget the interruption, also the disturber of the peace, and return whence we came to our proper spheres of interest and activity. Let us first consider my own table of figures, improperly quoted prior to their publication in the Transactions of the Congress.[1] The Secretary General finds me more than ready to apologize to the American public for having stated that there are cited in the census 2,406 cities instead of 2,405.[2] Is the addition or inclusion of one city too many such a grave error as to bring down upon a long suffering public such as his? He fails to state, be it noted, that he has allowed this egregious error to remain in my article in the Transactions, and, though he has read the final proof, has neglected to call it to my attention! Verbum sapientibus!

But as to the figures themselves! Are they within the limit of credulity? The New York Police Department estimates about 30,000 public prostitutes in New York. These figures are generally accepted as fairly accurate. I estimated 8,000 as an ultraconservative figure! In Chicago the authorities consider the conditions very similar to those of New York. For Philadelphia I estimated 5,000, before the Vice Commission was appointed and advertised as no Vice Commission ever has been before. The Vice Commission, after a year and a half of investigation, and after a well-recognized emigration by the underworld, still found 3,000 public women actively plying their trade. In San Francisco I estimated 5,000. Recent official state and municipal investigations have shown this number to be only a fraction of the ever new, and constantly replenished army of native and foreign prostitutes. The municipal clinic for the examination of prostitutes—one of the forms of public licensing of immorality which transcend all other public shames, and one which I took occasion to denounce at the public meeting in Washington at which the head of the clinic boasted of his participation in San Francisco's disgrace, has been ordered discontinued as ineffective and inimical both to the public morals and the public health. And so on down the line! The smaller cities actually harbor, as a rule, a larger ratio of public prostitutes than the average city of greater size. The nearer their vicinity to a still larger community, the more of a vicarious prostitute population in the latter, which often furnishes the greater portion of the immoral life of the two. There is no better illustration of this principle than is furnished by the New Jersey cities lying adjacent to large cities in Pennsylvania and New York. But as a rule cities of moderate population support more than their

[1] This table has also appeared with a full explanation of the basis of estimation of its figures in my book, "The Education of the Young in Sex Hygiene." This fact is evidently not known to the Secretary General.

[2] A still more recent series of data issued by the Census Bureau shows a still further inaccuracy in these figures but none that seriously bears on the general result.

share of public prostitutes. Our joco-serious Secretary General considers it preposterous that the estimated number of public prostitutes (544,350), and the "well over 1,000,000 clandestine prostitutes" should even approximate accuracy—because, forsooth, he does not wish so to believe. He cites no other valid objection! Nor has he advanced a single argument worthy of the name to prove that my figures are exaggerations rather than diminutives of the truth.

As a matter of fact, accurate figures cannot be furnished, as yet, either for the number of prostitutes or the incidence of the social diseases among the innocent and the guilty. For this very reason the policy of the Federation from the beginning has been and is to avoid definite figures until such time as accurate data are in hand. Frankness with the public on this point has been our method and policy from the inception of the movement. No one who has done any actual work in the field of sociology questions the sanity and the reasonableness of the figures submitted. Only a newcomer and an upstart, and a poorly informed meddler at that, would attempt to create a lack of confidence on the part of the public in a matter so critical from the standpoint of the public health. If there are 500,000 and upward of unfortunate women living a life of public shame in America, the people ought to and soon will know the fact, and demand the reason. Then they will learn that there are about 14,000,000 young men constantly in this land. Also that upwards of 800,000 of these come to maturity every year. Physicians are more and more of one mind in believing that upwards of 50 per cent. of all young American boys and men are infected with venereal disease (not including innocent infections), before they have reached a marriageable age. This statement of approximate accuracy implies the exposure of more than 7,000,000 young men every year, and most of them, probably, many times. Include now the married men, who go far toward supporting the public prostitute class, add the immoral old men and middle aged men, and the school boys, and the messenger boys, and the young boys living in both poor and sheltered homes—and none of them included in my classified list, and 500,000 prostitutes will not suffice to go round. Hence the growth of a clandestine prostitute class, to which I shall make only passing reference at this time. No attempt at misleading by such methods could be possible! The only conclusion at which any sane and even-tempered student of the problem can arrive is that there is an enormous army of poor, sorry girl lives in America, as in every other land, wrecked and set adrift in every instance by some man. All are sooner or later infected with contagious disease. Our attempt is to save the girls of the future from filling the ranks of these wretched ones of the present and past. Few of them live over five or six years after entering upon their fiendish trade. A few do live, even into old age, as has been forcibly pointed out. The murder of those who die is to be laid

some day and once for all upon the men, whose retribution has up to now been simply the curse of venereal disease. So-called criticisms like that of the Secretary General aid in intensifying the dense cloud of shame that envelopes American manhood, also so called. For we must all admit that until public prostitution is wiped from our escutcheon there is no true American manhood!

However little he may have intended it to have such an influence, this jester with serious things has trifled once too often and with a problem that will some day afford him small satisfaction in the thought that he has hindered rather than helped toward its solution. Five hundred thousand public prostitutes or 499,000? What matter which! Let us save the young girls who are hurrying to replace the 500,000, or the 499,000, unless men like him are promptly shouldered out of the way. This is the real business in hand! He is only helping those who would continue them in a life of sorrow and disaster.

His lack of practical knowledge of boys and men is so complete as to be pitiful. Only one other have I met of such an inexplicible simplicity,—an old schoolmaster, of fifty year's teaching experience, who had known only one instance of immorality among the pupils of half a century, and who would hardly credit a case of physical infection in another one of his boys when brought to his attention. The boys, and many of the city girls of today would laugh in their sleeves at the "old auntie" Secretary General, as they would call him. "I have something against you," he murmurs, "in the matter of depraving the minds of women." By this he means our attempt to enable the women by full intelligent knowledge to choose clean husbands instead of unclean, those that will guarantee them health, and live, sound babies, instead of disease, abdominal operations, and dead babies, or worse than dead. The women, let it be said, do not consider that we are depraving their minds, and I doubt very much whether they will yield to any one the right of judgment on this point.

Have we then no means of proving with reasonable accuracy how many of our young boys and men dishonor their mothers and their sisters and their future homes by living a clandestine immorality which they would not tolerate in the girls they intend to marry? Whither has fled all the wisdom and practicality of this Secretary General, whose hairs have grown gray in his confidence in men? Let him look upon the records of the dispensaries and of the quack physicians! Let him consult the drug store clerks! Let him at last come home to the general medical practitioner and he will learn a fact or two that should have been apparent to him had he followed the calling of a physician or had he been a live man among men. If he still doubts, let him stand beside the operating table and see young girl after young girl unsexed as the result of infection by a boy or man, mother of a home after mother of a home mutilated as the result of her infection

by a trusted husband, contaminated before or since marriage! Hold fast to your suspiciously trustful views, Mr. Secretary General, if you will! But do not ask us to withhold from the women of today and tomorrow the official figures of France to the effect that 25,000 babies died in one year in that country alone from syphilis. There is no reason to believe the figures would differ here, had we a sufficient number of men who were willing that figures should be recorded and known! It is men of your stripe that make it possible that syphilis and gonococcus disease are still officially almost non-existent contagions. Ask your army and navy authorities why the venereal diseases overtop the incidence of all the other ailments combined, if your silly confidence in the virtue of boys and men is based upon solid ground. Ask them why they consider it necessary even to take the ill-advised step of publicly assuming that soldiers and sailors will go out from their barracks and their ships to violate girls and women, and of furnishing them in advance with a preventive packet. When a body of earnest men such as comprise the Federation tells the women of this land that there are clean boys and men, but that they must know how to choose them from the unclean, it is not "depraving" the minds or the hearts of the women; rather is it encouraging them to believe that the dayspring is at hand. When it tells them, as it repeatedly has, that "not a majority" of the boys and men are clean, it tells them a burning truth, and one which I believe in my heart this man realizes even though he refuses to acknowledge it before the world of men and women! We are insisting that they have a right to life and to health and to living children. Heretofore they have been denied the truth! He holds up the hands of a prude, of a dear old lady, as it were, and bemoans the fact that we are contaminating them "with an obscene superstition, a filthy dream." It is, indeed, a filthy dream, rather a nightmare—the thought that he and men of his ilk venture to utter a word that will hinder the placing of woman where she belongs, at the head of the home. How does he sanction the devotion of a portion of every city to the perpetuation of a double standard of moral and physical health? How is the brothel supported if men are immune from the desire and the intent to lust whether or no? Who is to stop the flow of physical disease out of the infected section of the city into the clean woman and her babe through the husband, whom he characterizes as worthy of his belief, "infinitely more nourishing, than any possible derivative of the facts possible to be entertained."[1] I will tell you! It is to be the woman herself, when she has learned the shallow mockery of sophisms like his! When she looks for herself and sees what there is to see of feminine sacrifice upon the operating table! When she scans the long procession of the infant maimed and dead! When she sees the long column of once clean girls

[1] The Secretary General evidently did not lean upon a superlative grammarian in the construction of this sentence.

marching from city and country to fill the houses of ill fame! Then, and then only, will the housecleaning take place, which we trust will carry you, Mr. Secretary General, out with the rest of the active and passive abettors of the world's great crime.

And finally (and very much less important), Is the American nation expending $3,000,000,000 and upwards upon public immorality and its consequences, or is this figure out of all proportion to the actual expenditure? Let us grant for the sake of argument that my ultraconservative table is what it purports to be!

Let us assume that there are 500,000 public prostitutes scattered over this wide land! The recent disclosures in New York and Chicago and Philadelphia and San Francisco have made it clear that the average earnings of these girls amounts to not less than double the figure estimated by me. No one other than a constitutional objector would question the existence of a number of clandestine prostitutes in every factory, mill, and department store in the land. The Secretary General objects to the word "myriads" of industrial establishments, and yet even his mind must be able to grasp the fact that there are myriads, in the common use of the word. Some of these wantons charge their patrons (they call them "customers" or "friends") twenty-five cents, some charge twenty-five dollars. The professional prostitute scorns her who sells her virtue for a mere good time, or for anything other than hard money. So the wide country over in 2,405 cities, there are being spent directly on these women amounts varying between the $15,000,000 estimated by the people of Chicago for their own annual direct tribute to immorality to the thousands and hundreds of thousands squandered in the little cities that hardly earn the name. It does not require very active figuring to total $3,000,000,000. Many have estimated $1,200 as the average annual earning of the public prostitute. By no means in all or even in many instances does even one half of her earnings reach her own pocket. But estimate $1,000 annually, as the earnings of 500,000 women. At once there is an expenditure of $500,000,000 without going beyond the first deal in the procedure. Now add the cost of treatment of the venereal diseases in these girls, and in the boys whom they infect. The vast majority of the girls in the houses throw away $2 weekly in the belief that a so-called medical examination can protect them and their patrons. All are sooner or later permanently diseased! All infect their "friends!" Their "friends" very frequently infect their homes, meaning their clean wives and children! Every new case means money, money, money! Every new operation on a woman's abdomen means money! Every new injection with an anti-syphilitic remedy means money! Every blind asylum calls for money! Every foundling asylum costs something! Every venereal ward and dispensary, every nervous ward, every gynecological ward, every other service largely dependent upon

the venereal diseases for material, costs money! These are all part of the expenditure of American immorality! Broken homes, divorces, lawsuits are becoming more and more frequent as the result of venereal disease, and all cost money! Is a general total of $3,000,000,000 too large or too small an estimate, to cover all this demand when we admittedly require $3,200,000,000 to supply the craving for immorality's twins, alcohol and tobacco? I think no more need be said on this point. My attitude toward the Secretary General is simply and purely one of sorrow over his low moral tone. I cannot imagine his object in writing that which can only do harm. In more than fifteen closely printed pages, not one helpful, constructive thought! Of one thing, however, I am sure. The man who conceived his article is an obstructionist, a caviller! He is wickedly behind the times in his false philanthropy, if he is actually honest in all he has ventured to write and say! In his peculiar state he had only one duty, that of preserving a solemn and, probably to him, an awful silence. He will forgive me if I remind him in closing of a pithy verse, said to have been fashioned in the dog-star:

"The man who speaks in a score of tongues,
When all is said and done,
Don't hold a match to him who knows
How to keep still in one."

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SPECIAL TRAINING FOR HEALTH OFFICERS.

A long step forward in the special training of health officers has just been taken in the organization of the "School for Health Officers," of Harvard University and the Massachusetts Institute of Technology, acting in coöperation, of which the official announcement is made public as we go to press.

By coöperation especially arranged between the two institutions, it now becomes possible for properly qualified persons on payment of an annual fee of $250 to obtain access to the remarkable resources of the Harvard Medical School and other departments of our oldest university, as well as to the chemical, biological, sanitary and engineering opportunities offered by a great modern technical school. How remarkable these opportunities are can only be appreciated by an examination of the announcement itself, copies of which may be obtained on application to the director, Prof. M. J. Rosenau, at the Harvard Medical School.

No single prescribed curriculum is laid down which all must follow, but

from the many courses offered members of the school will be expected to choose such as their preparation warrants or their needs indicate. No degree of any kind is required for admission and no degree will be awarded for the completion of the course but, instead, a certificate to be known as the Certificate of Public Health (C. P. H.) will be given to all who complete satisfactory courses and requirements. In order to obtain the certificate in one year it will in general be required that the candidate shall be either a graduate in medicine, or in biology and public health, or be otherwise highly qualified. Failing these special qualifications, two or more years will ordinarily be necessary in order to obtain the certificate.

No one will be admitted to the school who has not completed at least two years of ordinary college work, including chemistry, physics, biology and French and German, or who is not otherwise specially qualified.

Persons already engaged in public health work will be admitted under certain conditions to special courses in the school, and every facility will be offered for obtaining equipment in tropical hygiene, public health administration and other practical aspects of the health officers' profession.

It is hardly necessary to say that the organization of this high-grade school probably marks a distinct epoch in American public health service, and no one can possibly be more interested in it than the members of the American Public Health Association. The editors of the JOURNAL extend their congratulations to the two institutions which are thus coöperating in an interesting, timely, and most important enterprise, and venture to predict, for this and all similar efforts to improve and broaden the special training of health officers, immediate success. It still remains, however, for the various members of the health officers' profession to see to it that the public, which is even more interested than they are in the success of schools of this sort, shall make sure that a reasonable tenure of office and proper salaries await those who are ready to devote their lives to the profession, and much popular education along this line still needs to be done.

THE COLORADO SPRINGS MEETINGS.

As we go to press the American Public Health Association is in session in Colorado Springs with nearly 200 members in attendance. Preliminary reports indicate a meeting of unusual interest both in representation and in the character of the discussions. Particular attention was given to the symposium on Pure Food which occupied the opening session. The papers presented on that occasion will be published in full in the October number of the JOURNAL and we trust will serve to lessen the confusion which surrounds that difficult subject and help to turn a now irresistible public sentiment into channels marked by a greater degree of sanity and scientific reasoning than is now the case. To this end the JOURNAL will lend its best efforts.

THE BACTERIOLOGY OF CHRONIC PROSTATITIS.

A. Parker Hitchens, M. D., and C. P. Brown, M. D.*

Read before the Laboratory Section, American Public Health Association, Washington, D. C., September, 1912.

When cultural methods began to be applied to the study of materials from the various parts of the body in health and in disease, the genito-urinary tract was among the first to receive attention. One year after the appearance of Koch's work on "Die Wundinfectionskrankheiten," Neisser (1), 1879, described the gonococcus and assigned to it the specific pathogenic function it is now known to possess. Although Bokai (2), Leistikow (3), Kraus (4), Arning (5), Sternberg (6), Oppenheimer (7), Bockhart (8), and Neisser (9) himself attempted the isolation of the gonococcus in pure culture, Bumm (10), 1885, was apparently the first whose efforts were crowned with success. Inoculation experiments finally established beyond question the etiologic role of the gonococcus.

As has been found especially by Van der Pluym and Laag (11), Waelsch (12), Bockhart (13), Aubert (14), Guiard (15) and Ayers (16), urethritis may be caused by other organisms than the gonococcus, the M. catarrhalis, B. coli, Staphylococci, etc.

Bumm (17), Turro (18), and Legrain (19) are among the earlier investigators who studied the bacteria found in the infected urethra. They describe many common air and water species undoubtedly incidental which may take no part in any existing morbid condition. Lustgarten and Mannaberg (20), Petit and Wassermann (21), Melchior (22), and more recently Pfeiffer (23) and Stanziale (24) have made most careful studies of the flora of the normal urethra. For technical reasons the reports of Pfeiffer and of Stanziale are the earliest made that may be accepted seriously. The latter studied conditions other than gonorrhea in twenty-seven patients, and found diphtheria-like bacilli eleven times, staphylococci thirteen times and streptococci three times. From comparative studies he was able to conclude that the urethra in diseased conditions contains no unusual bacteria other than the gonococcus; those usually found in health are, however, present in greater numbers.

Guiard (25), Banzet and Kresser (26), Cohn (27), Cumston (28), Young, Geraghty and Stevens (29), Clark (30), Rathburn and Dexter (31), and Cabot (32) have reported the results of examinations of material from

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the urethra and prostate. Others have made studies for specific purposes, as for instance, that of Saxe (33) who wished merely to determine the length of time the gonococcus may persist in the urethra. No cultures were made, the gonococcus being sought upon stained slides. One of the most elaborate studies of the genito-urinary tract is that made by Tomohara Tanaka (34) upon cystitis.

Few studies have been made of the anaërobic bacteria present in the urethra. Jungano (35) has isolated the Micrococcus foetidus, B. perfringens, B. neigeux, B. ramosus, B. of malignant edema, the B. intestinalis of Metchnikoff, and B. tethoides. He states that these organisms are present both in health and in disease. Guiard (36), Janet (37), Nogues (38) and Hogge (39) admit the possibility of the existence of aseptic urethritis. Such a conclusion has no value unless the association of anaërobic bacteria has been eliminated. Jungano (40) and Motz (41) do not believe that such a condition exists.

All this work confirms the fact so clearly demonstrated by Stanziale that the accessory bacteria found in chronic urethritis of gonococcal origin are only those that may be found normally. These include pyogenic staphylococci, both albus and aureus, streptococci, diphtheroids, and occasionally B. coli. Non-liquefying white staphylococci are present in many cases. The importance of these organisms, especially in chronic inflammatory conditions of the urethra is evident. In the healthy canal they exist without exerting any pathogenic influence. When, however, the gonococcus arrives and sets up inflammation a change in the nature of the fluids in and about the urethra takes place, resulting in a diminution of their antibacterial power. Those organisms already present then are furnished with a most suitable culture medium and some of them increase in virulence. Thus they continue the inflammation after the gonococcus has become of minor importance or has disappeared.

While Neisser, Finger and several others accept the persistence of the gonococcus in chronic urethritis and prostatitis for a year, Wassidlo, Ruggles, and Goldberg attach great significance to mixed and secondary infections (Notthafft, Arch. f. Derm. & Syph., 1904). It is not improbable that after the active process has subsided the lining membrane of the urethra and prostate is left in such a state of hypertrophy or other morbid condition that the mucous glands produce a fluid abnormal in quality or in amount and suitable as a culture medium for the accessory bacteria. It might be suggested also that if something of this kind exists the irritation is further kept up by the metabolic products of the bacterial growth. It is possible that one explanation applies in certain cases and in other cases another. That some such difference exists is strongly suggested by the fact that treatment of chronic infections of the genito-urinary tract by vaccine therapy as suggested by Sir Almroth Wright is sometimes followed by posi-

tive results while in others the effect is negative. It must also be remembered that the structure of the prostate gland is peculiarly adapted to the persistence of bacteria within it. The blood supply is such that focal infections may very readily occur. In this regard it is to be compared with the tonsil which may harbor streptococci for years without calling attention to this locality in any way as the cause of a chronic and persistent general intoxication.

To obtain material from various parts of the genital apparatus great care must be taken to avoid the possibility of contamination from other parts. The purpose of an investigation influences the technique. Cohn (42) irrigated the urethra with boric acid solution until it flowed away clear. A sterile tube was inserted as far as the bulb; this was dried with sterile cotton after which the prostate was massaged. Secretion was obtained with a platinum loop or upon a pledget of cotton. Pfeiffer (43) in his study of the bacterial findings in the normal male urethra used a sterile metal catheter like the tube of an endoscope through which he introduced a sound or platinum wire. By such a method he could not differentiate between the bacteria present in the anterior urethra and those existing in the deeper parts since those near the meatus would be pushed back by the tube. To overcome this source of error Stanziale (44) constructed a special apparatus which enabled him to ascertain the position of the various germs at definite distances from the orifice. This instrument consists of a straight, cylindrical metal cannula 24 cm. long, corresponding to No. 18 of Charriere's scale. The tube is graduated in centimeters to show the depth to which the instrument has been inserted. Inside this tube slides another similar tube but about 2 cm. longer. In position the second tube projects about 1 cm. beyond the other. Its front end consists of two fairly large spoon-like branches. When they are closed they form an olive-shaped end, thus facilitating the introduction of the instrument. When it has been passed to the desired depth, the inner tube is pushed in about 1 cm. farther permitting the olive to open and spread the urethra. The platinum spoon is then pushed in and material collected. The spoon is then pulled back, followed by the inner tube and the instrument is withdrawn.

Young, Geraghty and Stevens (45) studied nineteen cases. They made twenty-six examinations, some cases being studied more than once. The foreskin, if present, was retracted and washed thoroughly with green soap and water. The patient urinated in three glasses. A sterile urethroscopic tube was introduced after thoroughly washing the urethra with sterile water. The tube was again thoroughly washed and cultures made. The prostate was then massaged and the pus collected directly into a culture tube or on a platinum wire. In most cases agar plates were used. Hydrocele agar was used for seven cases. No gonococci were found. The

plates were made from the culture tubes and not directly from the expressed secretion.

In our work the external genitalia were thoroughly washed with tincture of green soap and carefully rinsed with a 1 to 2,000 solution of bichloride of mercury. From the douche bottle, elevated about six feet, the urethra was flushed at least one half dozen times with sterile physiological salt solution (0.85 per cent.), probably 250 to 300 cc. being used on each patient. For each patient a fresh sterile glass nozzle was replaced in the rubber tube leading from the bottle.

After thus washing the urethra the prostate was massaged, the patient was placed in a reclining position upon a table and a sterilized urethroscopic tube lubricated with sterile liquid petrolatum was introduced. The expressed fluid was collected through the tube by means of a glass inoculating pipette. The massaging, the passing of the tube and the collecting of the fluid were all done by different persons, so that likelihood of contamination was practically eliminated. A drop or two of the fluid was put upon the surface of an ascitic agar plate, the same amount was dropped into a tube containing ascitic bouillon, and from the remainder slides were made. The material on the plates was spread carefully over the surface by means of a previously sterilized glass spreader. After distributing the material on the original plate the spreader was then rubbed over the surface of two other plates successively, without reinoculation. The following day the ascitic bouillon culture was streaked on ascitic agar plates and the colonies studied in the same manner as those from the original plates. All cultures were incubated at 38° C. for 24 hours, after which the colonies were fished.

The agar was the ordinary nutrient agar containing about ten per cent. sterile ascitic fluid. The reaction of the agar was between plus 1.0 and plus 1.5.

Fishings were all made to ascitic agar slants. After twenty-four hours incubation at 38° C. they were stained by Gram and by methylene blue. They were then studied by the ordinary methods to determine their identity. The results of this study are noted in the accompanying chart:

The white non-liquefying micrococci grouped like staphylococci were not studied further. Both strains of the B. coli ferment dextrose, saccharose, and lactose.

The uniformity with which diphtheroid bacilli were found led us to attempt their further classification. Numerous attempts have been made by other workers to classify diphtheroid bacilli but no one seems satisfied with the present methods. The biometric method suggested by Professor Winslow, since it is based upon the relative acidity produced in carbohydrate media and not upon the arbitrary amount necessary to turn an indicator, offers a distinct advance in determinative methods.

TABLE I.

Number.	Date.	Staph. aureus.	Staph. albus.	Non-liquefying white cocci.	Streptococci.	Diphtheroid.	Bac. coli.	Gonococci.
1	1/18		+	+	+			
2	1/18			+		+		
3	1/18		+		+			
4	1/18		+	+	+	+		
5	1/18					+		+
6	1/25	+		+	+	+		
7	1/25			+	+			+
8	1/25		+	+	+	+		
10	2/1		+			+		
11	2/1		+	+		+		
13	2/1	+	+		+	+		
14	2/1	+		+				
15	2/1		+		+	+		
16	2/1	+	+	+	+	+		
17	2/8		+	+	+	+		
18	2/8	+	+		+	+	+	
19	2/8		+	+				
20	2/8		+	+	+	+		
21	2/8			+	+			
22	2/8		+	+	+	+		
23	2/8		+	+		+		+
24	2/8	+	+					
25	2/8	+		+		+		
26	2/8			+				
27	2/8			+	+			
28	2/8					+		
29	2/8	+	+	+		+		+
30	2/15			+	+	+		
31	2/15		+			+		
32	2/15		+	+		+		
33	2/15			+	+	+		
34	2/15		+	+				
35	2/15			+		+		
36	2/15		+		+	+		
37	2/15	+			+	+		
39	3/7			+		+		
40	3/7			+	+	+		
41	3/7		+	+	+			
42	3/7			+		+		
43	3/7	+		+	+			+
44	3/7		+	+		+		
45	3/8			+	+		+	
46	3/8	+			+			
47	3/8			+	+	+		
48	3/15		+	+	+			
49	3/15			+	+	+		
46 cases		11	24	34	27	31	2	5

SUMMARY.

Staphylococcus aureus	11 times
Staphylococcus albus	24 times
Non-liquefying cocci	34 times
Streptococci	27 times
Diphtheroids	31 times
B. coli	2 times
Gonococci	5 times

We have under way a study of these strains by the biometric method. Those isolated by us fall into the following groups when classified by their reactions on the Hiss serum-water-medium.

TABLE II.

DIPHTHEROID BACILLI.

Culture. No.	Dextrose.	Malrose.	Saccharose.	Mannite.	Lactose.	Dextrin.	Inulin.	Glycerine.	Gelatine.
20	0	0	0	0	0	0	0	0	0
29 A.	0	0	0	0	0	0	0	0	0
33 C.	0	0	0	0	0	0	0	0	0
15	+	0	0	0	0	0	0	0	0
17 A	+	0	0	0	0	0	0	0	0
32	+	0	0	0	0	0	0	0	0
37 B	+	0	0	0	0	0	0	0	0
42 A	+	0	0	0	0	0	0	0	0
8	+	+	0	0	0	0	0	0	0
11 A	+	+	0	0	0	0	0	0	0
18	+	+	0	0	0	0	0	0	0
16	+	+	0	0	0	0	0	0	0
23	+	+	0	0	0	0	0	0	0
29 D	+	+	0	0	0	0	0	0	0
40	+	+	0	0	0	0	0	0	0
44	+	+	0	0	0	0	0	0	0
49	+	+	0	0	0	0	0	0	0
47 A	+	+	0	0	0	0	0	0	0
12 B	+	0	+	0	0	0	0	0	0
5	+	0	+	0	0	0	0	0	0
13 A	+	0	+	0	0	0	0	0	0
9 A	+	0	+	0	0	0	0	0	0
28	+	0	+	0	0	0	0	0	0
6	+	+	+	0	0	0	0	0	0
9 B	+	+	+	0	0	0	0	0	0
12 A	+	+	+	0	0	0	0	0	0
29 B	+	+	+	0	0	0	0	0	0
39	+	+	+	0	0	0	0	0	0
47 B	+	+	+	0	0	0	0	0	0
11 B	+	+	+	0	+	+	0	0	0
33 B	+	+	+	0	+	+	0	0	0
36 B	+	+	+	0	+	+	0	0	0

Morphologically and culturally these organisms cannot be arranged to agree with a classification based upon their carbohydrate reactions. This fact suggests the possibility that there may be several morphologic varieties in each group as is the case with true diphtheria bacilli.

It is noteworthy that in these forty six cases of chronic prostatitis of gonococcal origin the gonococcus was isolated but five times and was seen

on stained slides but nine times. From a public health standpoint such cases are of the greatest importance. It has been demonstrated many times that the accessory bacteria may be present in such abundance that although gonococci are present they are demonstrable only by repeated examination and by special methods. Unless the examination has been made at least three times and at least once by the provocative method no case of chronic prostatitis or posterior urethritis should be released as non-infectious.

These cases were selected by Drs. Uhle and McKinney from their service at the University of Pennsylvania and the German Hospital. It is a pleasure to acknowledge our indebtedness to Drs. Uhle and McKinney for their kind coöperation in carrying out this work.

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FARM WATER SUPPLIES, WITH SPECIAL REFERENCE TO DAIRY FARMS.

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Three types of water supplies may commonly be found upon farms. First and most numerous is the shallow well or dug well, varying anywhere from 15 feet to 40 feet or even 50 feet in depth, depending upon the amount of labor necessary to reach the water-bearing strata, and in close proximity to the house or barn.

Second in number throughout New England would probably be found the wells of similar character or springs situated at a greater distance from the buildings and with pipes leading the water directly to the buildings, either by gravity or by the use of some pumping apparatus, wind power or small engine.

A few farms are found having water supplies from the deeper sources, driven wells or artesian wells, but these are relatively rare. The character of the soil has a very considerable bearing upon the character of the water and the ease with which it may be polluted. A gravelly, open soil containing stones of varying size may offer so little resistance to the passage of organisms and materials from barnyards, drains, etc., that the water is constantly in a state of contamination. Unfortunately, this cannot be detected by taste or smell in most instances because it is only when the pollution becomes very severe and the amount of freshly decomposing organic matter relatively large that compounds would be formed by putrefactive change in sufficient amounts to give a distinct taste or odor. In fact, certain waters which are constantly polluted seem to have a particularly soft and pleasing taste, especially if the wells are of considerable depth so that the water is cold, and if, at the same time, it is clear and free from color. Should such a water supply, however, become polluted with bacteria of infectious disease, the danger from this source would be enormous, and undoubtedly many deaths from typhoid and other diseases of that character are due to this type of pollution.

In the early days when no account of the purity of the supply from the bacteriological standpoint was considered, because there was no knowledge of the bacteria themselves, the custom of establishing the water supply for a farm at the point most convenient for the users, either in the house or barn, seems to have become formulated in New England. After examination of several hundred farm water supplies, especially on dairy farms from which milk is sent to Boston, I am convinced that the consideration of

the relation of the water supply to the barnyard, to the sink-drain, to the privy, or any other possible source of contamination, was rarely considered, and that the most emphasis was placed on establishing it at a point so that the amount of labor involved in carriage is the least, and the probable continuance of the supply through the year, the greatest. In many instances, therefore, wells which constitute by far the great majority of the supplies of individual farms are placed midway between the back door of the house and the barnyard, frequently on the edge of the barnyard, with no special reference to the drainage areas or drainage planes, and in such a position that if typhoid fever, or some other intestinal disease should occur in the house, the possibility of contamination of the water supply is distinctly great. While this is a condition which is found especially on old farms, it is not confined to them but may frequently be observed where the general planning out and building of an establishment has taken place within a very few years. The general plan followed in a majority of cases seems to be that of the very early days and the general assumption made that since no trouble occurred to our ancestors, no trouble can occur to us.

Of what may be regarded as the natural types of waters, namely, meteoric, surface and ground waters, there is a decided difference in the chemical and bacteriological characteristics. The meteoric waters are essentially those falling to the ground in the form of rain, snow or hail and since these are produced by the evaporation and condensation of moisture from larger bodies of water, like lakes, rivers, and the ocean, these partake somewhat of the nature of a distilled water, hence the common saying that rain water is a pure water, whereas a surface water may be very far from pure. Chemically, then, the meteoric waters are in general very soft, very low in the organic substances which we look upon as suspicious, and until they come in contact with the soil or with roofs of buildings, they contain very few of those micro-organisms known as bacteria, except the ones which are found attached to dust particles and floating in the air.

Since at the beginning of a storm these may be quite numerous, the rain falling in the early part of a shower, or the snow in the early part of a storm may be bacteriologically less free from polluting material than that which falls in the later periods of precipitation. From the standpoint of ordinary supply these may be largely disregarded, except in those instances where cisterns are provided for the collection of such waters. In New England it is not uncommon to find cisterns for the collection of rain water, not to be used for drinking purposes, but for other domestic purposes for which the softness and general purity makes it extremely valuable and satisfactory. In the south and west, however, cisterns are frequently employed for the storage of drinking water; in fact, in certain parts of the country almost the only drinking water available is that which has been conserved in this way. To safeguard, then, the character of such

water it is necessary to have the cisterns or tanks properly covered to prevent infection from without, a screen to prevent the entrance of insects, such as mosquitoes, and it would probably be most advisable, if possible, to have some kind of by-pass or device by which the first water could be rejected, since this is bound to carry with it the deposits of dust, germs, and possibly more objectionable material which may collect upon roofs between storms.

The number of bacteria ordinarily found in such waters is very low. In the water falling near the end of a storm we may even find no germs since they are all carried down with the earlier fall. Such a pure water, if not contaminated later by being collected in infected or leaky cisterns, is undoubtedly very safe to use since the germs of disease are absolutely eliminated. It frequently, however, is very flat in taste or may partake of the taste of the shingles or other material over which it has flowed, but by proper aëration even rain water may become pleasing to the taste as well as of absolute safety.

With surface waters the situation is somewhat different. These are rain or snow water which has reached the ground and then by flowing over the surface has come into certain well defined water courses, brooks, rivers and ponds. The fact that the water has been in contact with the soil and that it perhaps has filtered for a small distance through the upper layers of the soil, has been sufficient to change the character of the water both chemically and bacteriologically. Chemically, those substances which are present in the soil in soluble form are taken up by the water. Consequently the chemical analysis of a surface water may vary markedly from the chemical analysis of the water before it reached the ground. Bacteriologically the same general effect is observed; that is, the water takes up mechanically particles of low specific gravity, organic matter, bacteria, etc., and we, therefore, find surface water ordinarily containing a considerable amount of dissolved and suspended material and considerable number of bacteria.

The amount and character of the dissolved and suspended material depend absolutely upon the character of the soil. In any water falling on a rich soil where nitrogenous material is undergoing decomposition we shall find the presence of the different compounds of nitrogen, free and albuminoid ammonia, nitrites and nitrates in varying amounts, depending upon the rate and amount to which the nitrification has been carried on in the soil. Similarly, we shall find the bacteria to be variable in numbers and in kinds, according to the character of the organic matter which serves them as food. A richly manured field, for example, containing organic matter in various stages of decomposition would give up to the water flowing across it or percolating through the upper layers of the soil, varying amounts of nitrogenous constituents and chlorine and possibly large num-

bers of bacteria, some of which might be of intestinal types or even of pathogenic types and, consequently, most undesirable.

The surface waters in densely populated regions, therefore, may be unsatisfactory for domestic purposes because of the large amount of organic matter, both of chemical and bacteriological character which find entrance to it. The germs present in the excreta of animals, both human and otherwise, are likely to occur in such a surface and when it is borne in mind that among these bacteria we may have causes of intestinal diseases or disturbances, the danger of using such water is evident. On the other hand, surface water from an uninhabited or sparsely inhabited region, especially where it is not in direct contact with richly fertilized fields, may be absolutely safe from the sanitary standpoint, because while they may contain some bacteria they would be free from pathogenic types. Occasionally waters may be found which chemically show all the marks of purity and yet which are polluted in the bacterial sense to such an extent as to render then undesirable. An instance of this sort came to my attention a few years ago in which a spring situated on a hill in a pasture was used as the water supply of a country house. Chemically, the water left little to be desired as to purity, but bacteriologically there was unmistakable evidence of pollution. Investigation showed that this spring was also used as a drinking place by cows and horses and that the intestinal bacteria found in the water were from these animal sources rather than from domestic sewage. At the same time it could never be regarded as a satisfactory condition and the water supply was, therefore, discontinued for a short time while the surroundings could be carefully freed from infecting material and fences put up to avoid repetition of the trouble.

Frequently, inspection of the source of a water supply will give all the data that are necessary to condemn, for it is evident that if drainage from privies, sink-drain, cesspools, barn yards, hog pens, or other animal quarters enters directly into the water supply it is unfit for human consumption. Then on the other hand, inspection may show nothing of the sort, while a chemical and bacteriological examination might reveal sources of pollution.

With deep wells and springs the chemical and bacteriological characteristics differ again from those of the surface waters, or shallow wells. In these cases the water has gone through, presumably, a process of natural purification by filtration. The lower stages of nitrogen compounds are oxidized in the soil by the bacteria there resident and occur in ground waters in the form of nitrates if previous pollution has taken place. The chlorine, however, would not be appreciably changed in this way. A water supply, therefore, showing high chlorine and nitrate content, but otherwise satisfactory, might easily be a purified contaminated water. Most shallow wells will show a certain amount of nitrates, especially if they are situated within a short distance of houses, barns, gardens, etc. If situated too close

to such contaminating sources, the process of purification will not be complete but the water will show in addition to the nitrates, nitrites and free ammonia to some extent. The most striking evidence of all, however, is supplied by the bacteriological examination, for here we can show by direct and accurate means the exact extent to which pollution is taking place and the exact types of organisms which occur in the water. Whereas the chemical examination of a water supplies us with data which show inferentially that pollution has or has not taken place, the bacteriological examination shows us whether undesirable types of organisms are or are not entering the water at the present time.

The examination of the farm water supplies in the laboratory may be carried out by the application of the usual sanitary chemical examination combined with the bacteriological examination. To do this requires in most instances elaborate laboratory fittings and means that the samples must be shipped to a laboratory with all this equipment in order to obtain the necessary data. When we consider exactly the meaning of the information supplied by the chemical examination, we see that it is after all only another way of expressing our belief that pollution with intestinal organisms, or with undesirable material at least, has taken place or is taking place.

Without discussing here the significance of albuminoid and free ammonia, nitrites and nitrates, it is sufficient to say that these expressions convey to the trained mind, a picture, depending upon the amounts of such materials found, of a water supply receiving polluting material, or of a water supply which has in the past received such material, but is receiving it no longer. They give absolutely no information regarding the presence of undesirable types of bacteria at the moment, and it is only by an elaborate study of the relation of carbon to nitrogen that we can determine whether the polluting material was actually of animal origin or not.

By the bacteriological methods, on the other hand, we are able to show directly the presence or absence of the undesirable intestinal bacteria, and if they are found we have every reason to believe that they came only from human or at least animal sources, and that they may be accompanied by the still worse pathogenic species, such as typhoid bacillus.

Furthermore, the necessary facts as to pollution can be obtained by a bacteriological examination of the water, conducted without very elaborate laboratory facilities. It is even possible to make a house to house canvass, actually beginning the examination of the water supply of each while still on the premises, if one will take the trouble to carry sterilized culture media and the limited necessary equipment for the proper making of a few plate and tube cultures. It is true that one cannot conduct elaborate quantitative experiments in this way and that here the laboratory is an essential, but in view of the perfection to which the presumptive test for

intestinal organisms has been brought, we can determine the main point, that is, whether the water supply is a polluted or an unpolluted one, without actually making the enumeration of the number of bacteria per cubic centimeter or the relation of counts of body temperature to room temperature types. Inoculation of dextrose broth and lactose bile either in bent tubes or in tubes containing inverted smaller tubes or vials can be carried out by the trained bacteriologist very quickly and effectively, using only an alcohol lamp for the flaming of tubes and pipettes and some simple means of preventing dust infection, if one has a supply of sterile media and sterile pipettes. These cultures, after all, supply us with the most essential data as to pollution. The later confirmatory work can and must be done at the laboratory.

If we find that every cubic centimeter of the water or a majority of several one cubic centimeter portions of a particular well or spring gives fermentation and marked gas formation in lactose bile and dextrose broth, we may be reasonably sure that pollution organisms of the colon type are present, although it must be admitted that there are bacteria which will ferment these culture media which do not belong to the colon group. They are, however, relatively rare and probably are in themselves, for the most part, quite as objectionable as the colon bacilli. For practical purposes, therefore, our presumptive tests may be still regarded as unimpaired, and the above dictum as to the significance of results will generally, but not always, stand.

If one wishes to go somewhat further and use fractions of a cubic centimeter of the water in question, of course the tests can be made with even greater accuracy as to the approximate number of the undesirable fermenting types. By carrying sterilized agar about in bottles it is not a difficult matter to make plate cultures as well, and these can be taken at night to the laboratory, if it is within reasonable distance, for incubation, or a temporary incubator can be installed at some central point while the water supplies of a particular district are being studied. Where ever it is possible, however, the examination should be carried out with greater thoroughness; the actual counts on agar at 20° and 37° and on litmus lactose agar should be obtained. Wherever possible, in my opinion, the laboratory examination should supplant the field determination because of the greater strictness with which we can avoid contamination from the air and from other sources. Field work, however valuable, is always of course subject to some error from this source.

In the examination of dairy farm water supplies we have found it of advantage to obtain certain data, and for purposes of filing it is convenient to have this information recorded upon some standard form of card. A form which would be used in this laboratory in any extended investigation would be somewhat as follows:

FROM WATER SUPPLY INSPECTION

Name of tenant.....
No. of persons in family.....
Children, servants or laborers.....
General health of family.....
Source of water, well, spring, etc.....
Depth, if well.....
Distance of source from house drain (a).....
Distance from cesspool or privy (b).....
Distance from barnyard (c).....
Position as regards drainage from
a. .....
b. .....
c. .....
Surface wash?.....
Immediate surroundings.....
Protection against contamination from cattle, manured fields, etc.....
Covering, if any.....
Date.....
Town and State.....

Water piped to house?.....
Water piped to barn?.....
Character of tank, if any.....
Kind of pipe.....
General character of soil.....
If well, when last cleaned.....
General appearance of farm surroundings .....
Is water used for cooling milk or food?.....
Sample taken at.....

Analytical Data.

20° C. count.....
37° C. count.....
Litmus Lactose Agar count.....
Acid formers.....
Presumptive test, dextrose broth.....
Presumptive test, lactose bile.....
B. Coli.....
Remarks:.....

Examination by the writer of the water supplies of 202 dairy farms situated between twenty-five and forty miles from Boston have yielded results which are of much interest in showing actual conditions likely to be met in a long-settled, intelligent and well-inspected region, probably rather superior hygienically to the rural districts of most of the country. Of these 202 farm water supplies, twenty-nine, or 14.4 per cent.; were shown to be badly polluted, either from privies or from some other sources, so that the water was unfit for use as a drinking water or for domestic purposes, or for the washing of milk utensils, pails, cans, strainers, etc., purposes to which these waters had been put. In addition to the foregoing, ten gave evidence that the danger of contamination was immediate, although the analysis showed in each case that intestinal types of organisms were not actually present in the water. In some instances these were wells located in the barnyard and hence likely to receive pollution with a heavy rainfall by the influx of polluting surface material, or they were in too close proximity to sink-drains, privies or some other dangerous source. It is, of course, possible with good filtering material, such as a fine sand, that a well may be within a very short distance of such sources of contamination for a long time without actual pollution taking place, but it must be borne in mind that such a state is not satisfactory. Conditions might arise by which this slender barrier would be broken down, hence it is very desirable that the protecting layer of material between any of these common sources of contamination and the water itself should be as strong and resistant as possible. For practical purposes,

therefore, thirty-nine wells out of 202 were condemned as either being actually polluted with intestinal organisms or in danger of pollution at any time. Practically, then, one fifth of the wells of a portion of the country, well above the average, were found to be of this undesirable character.

In the following table the principal bacteriological data are given, viz., the 20° count, the 37° count on litmus lactose agar and the acid forming colonies as well as the results of the presumptive tests with dextrose broth and lactose bile. In expressing the results of the presumptive tests, a positive result, indicated by a plus sign (+), means that a majority of one cubic centimeter portions of the water in a series of five or more tubes have given gas to the amount of 30 per cent. or more in twenty-four hours at 37° C. Positives were not subjected to confirmatory tests in all cases but the results obtained here and elsewhere have led the writer to believe that when the results indicated above are obtained it is almost indisputable evidence of pollution by intestinal types of organisms.

Twenty of the farms examined were supplied with water from the public systems of two towns and in only two cases was there any evidence of contamination, so it has been thought unnecessary to tabulate these results.

A survey of the figures both for wells and springs shows great variation in the number of bacteria developing at room temperature and seem to offer conclusive evidence that, except in cases where the figures are enormous, the room temperature count is practically without value as a basis for judging the sanitary character of a water. This is shown in well No. 132, where with a total count of but 90, pollution was proved, and again in well No. 140, where, with a total count of but 20, pollution was shown. On the other hand, wells numbered 29 and 36 with 2,000 and 1,850 respectively, and spring No. 17 with 6,000 proved to be absolutely free from intestinal organisms.

It should be pointed out that the relation between the 20° count on gelatin and the 37° count on litmus lactose agar is somewhat different from that existing between the 20° and 37° count on ordinary nutrient agar, as the lactose medium seems to have a somewhat inhibiting action for certain kinds of bacteria.

It may also be noted that in some instances the presumptive tests have revealed the presence of fermenting intestinal organisms which would have been entirely overlooked by the use of the litmus lactose agar plate alone. In fact, it may be assumed that the latter medium is far from satisfactory as a presumptive test and gives but little aid in detecting pollution in small amounts.

The presence of considerable numbers of bacteria in shallow wells is to be expected from our knowledge of soil bacteriology. It is only when the water comes from considerable depths or when the soil is a sand with little organic matter that we may expect to find the numbers of bacteria very

BACTERIOLOGICAL EXAMINATION OF SHALLOW WELLS.—TABLE I.

Water supply number.	20° C. count.	Litmus lactose agar, 37° C.	Acid formers.
1	1	0	0
2	55	4	2
3	12	0	0
4	0	0	0
5	245	22	0
6	60	10	0
7	37	2	0
8	15	1	0
9	102	7	0
10	13	5	0
11	288	2	0
12	24	1	0
13	665	22	0
14	375	..	0
15	113	2	0
16	40	1	0
17	43	2	0
18	3	1	0
19	17	2	0
20	515	3	0
21	2	1	0
22	75	5	0
23	45	2	0
24	125	12	0
25	215	1	0
26	60	1	0
27	125	17	0
28	47	13	0
29	2000	3	1
30	0	0	0
31	255	5	0
32	42	1	0
33	25	2	0
34	82	2	1
35	8	0	0
36	1850	25	1
37	145	2	0
38	10	2	0
39	115	2	0
40	..	3	0
41	12	2	0
42	..	100	0
43	..	6	0
44	30	0	0
45	10	0	0
46	15	0	0
47	10	..	0
48	25	9	0
49	20	..	0
50	45	..	0
51	50	5	0
52	16	3	0
53	150	0	0
54	15	3	0
55	liquefied	5	0
56	..	1	0
57	75	2	0
58	800	10	0
59	250	2	0
60	390	21	0
61	5	2	0
62	60	15	0
63	350	38	0
64	85	2	0
65	liquefied	6	0
66	196	1	0
67	53	40	0
68	140	3	1
69	9	0	0
70	140	2	0
71	12	1	0
72	200	3	0
73	19	1	0
74	165	0	0
75	312	1	0
76	1015	3	0
77	105	17	0
78	1	0	0
79	13	7	0
80	416	0	1
81	13	2	0
82	370	3	0
83	49	1	0
84	450	1	0
85	300	1	0
86	415	6	0
87	800	10	0
88	196	0	0
89	1200	4	0
90	6	0	1
91	340	8	0
92	390	21	14
93	liquefied	24	0
94	60	10	0
95	liquefied	19	0
96	2	1	0
97	190	0	0
98	100	4	0
99	4	2	1
100	165	6	0
101	60	20	2
102	..	20	2
103	..	34	0
104	50	6	0
105	50	1	0
106	130	5	0
107	600	14	8 weak
108	60	12	0
109	625	165	0
110	45	10	15
111	36	5	1
112	2	3	0
113	16	3	0
114	37	1	0
115	20	25	0
116	0	0	0
117	10	1	0
118	2	3	0
119	8	1	0
120	7	1	0
121	12	0	0
122	125	37	0
123	385	26	0
124	1200	4	0
Presumptive tests of samples 1 to 124 all negative.			
125	141	24	7
126	1950	675	11
127	120	13	8
128	3000	11	3
129	440	28	6
130	1100	19	6
131	225	31	28
132	90	13	1
133	2000	215	37
134	..	35	10
135	143	12	7
136	..	48	0
137	425	13	0
138	126	6	1
139	600	30	6
140	20	2	1
141	74	2	0
142	145	7	3
143	550	65	20
144	122	5	0
145	125	2	0
146	425	13	0
147	134	2	0
Presumptive tests of samples 125 to 147 all positive.			

small. Unfortunately, owing to lack of data as to depth, we are unable to correlate the depths of the wells here studied with numbers of bacteria found.

In the case of springs, on the other hand, we might expect to find very low numbers of bacteria owing to the deep seating of the source of the water. It commonly happens, however, that the spring on breaking through the surface really becomes a surface pool and as such provides a favorable

BACTERIOLOGICAL EXAMINATION OF SPRINGS.

Water supply number.	20° count.	Litmus lactose agar, 37°.	Acid formers.	Water Supply number.	20° count.	Litmus lactose agar, 37°.	Acid formers.
1	175	7	0	22	5	1	0
2	43	2	0	23	45	20	0
3	21	1	0	24	liquefied	0	0
4	286	11	0	25	"	3	0
5	950	0	0	26	75	5	0
6	207	0	0	27	few	0	0
7	28	7	1	28	liquefied	0	0
8	4	2	0	29	8	0	0
9	175	7	0	30	63	0	0
10	25	4	0	31	10	0	0
11	5	2	0	32	175	21	0
12	24	2	0	33	0	0	0
13	36	6	0	34	226	18	0
14	..	2	0	35	2	0	0
15	10	0	0	36	300	50	0
16	20	5	0	37	171	105	7
17	6000	5	0	38	liquefied	500	..
18	liquefied	23	0	39	"	48	1
19	"	5	0	40	many	95	8
20	30	2	0	41	2040	31	4
21	100	20	0	42	..	80	5

Presumptive tests of samples 1 to 36 negative and samples 37 to 42 positive.

place for the development in considerable numbers of such organisms as Pseudomonas fluorescens, B. aquatilis, etc., so that these may frequently be found in almost pure culture. Examples of this sort are shown in supply Nos. 5, 17 and 41.

In case of polluted wells, the filth which constitutes the contaminating substance may gain entrance from surface wash or through cracks in the upper part of the well casing, or by cracks in the planking or other covering. Another possible method is by pollution of the bucket. The ordinary well bucket is handled by many hands and these are frequently not clean. If a person with filthy hands draws water and handles the bucket, rope or chain, the material deposited on these may gain immediate access to the well, and thus indirectly be carried from the hands of the infected person to the mouths of others who drink water from the well. When we bear in mind the possibilities of germ carriers such as typhoid carriers, etc., this becomes a serious matter.

The bacteriological methods of examination historically followed the chemical methods of examination in development, but their directness and accuracy have, in my opinion, made bacteriological water analyses of far greater value than the chemical analyses can be.

As to what may be done to reduce the chances of infection of a farm water supply, I should recommend the following procedures:

1. Guard against contamination with human fecal matter by providing a sanitary privy in cases where water closets and well constructed cesspools are lacking.

2. See that the casing of the well is of suitable material, is tight and extends for at least a foot above the surrounding surface. It is of advantage to have it made of clay or cement to be impermeable.

3. Provide a tight top or platform so that the water cannot drip through the cracks carrying contamination from dirty boots.

4. Replace the bucket by a pump when this can be advantageously done. When it cannot, use a bucket requiring as little handling as possible or an automatic one.

5. See that the position of the well is not in the direction of the natural drainage from barnyard, sink-drain, or privy. If within 40 feet of these be sure that the soil is of good filtering material, sand, etc., and free from fissures and easy by-passes for the surface water to enter the well.

If these precautions are observed and all filth of every description is vigorously excluded, one may feel confident that the water supply will be safe and wholesome.

CITY LIFE IN RELATION TO TUBERCULOSIS. A PLEA FOR BETTER SURROUNDINGS FOR FACTORIES AND BETTER HOMES FOR THE WORKING CLASSES.

Isaac W. Brewer, M. D.

Tuberculosis has been called the "Universal disease" because it prevails in all portions of the globe and effects all classes of society. It is, however, less prevalent in the arid regions, and the well-to-do suffer less than the poor who are crowded into tenements in our large cities.

Until the latter part of the nineteenth century the attitude of the general public and of the medical profession towards consumption was one of despair, the disease being considered incurable. Most of the efforts of the physician were expended in making his patient comfortable and practically nothing was done to prevent the disease. There were, however, men who held other views and who endeavored to cure the disease. As early as 1840 George Boddington of Warwichshire, England, wrote an essay "On the Cure of Pulmonary Consumption on Principles Natural, Rational and Successful," in which he advocated life in the fresh air under medical supervision, with an abundance of food. He insisted that cold never injured the patient. He established a sanatorium for the treatment of the disease according to his views but so great was the opposition that it had to be abandoned.

In 1856 Herman Brehmer advanced similar views in a thesis for his doctor's degree and three years later, in the face of great opposition, opened at Gördersdorf, the first successful sanatorium for the treatment of the disease.

The work of these men and their followers was like a single candle flickering in the darkness which obscured the professional view regarding tuberculosis. Nevertheless the flame was kept burning and was fanned into a bright blaze in 1882 when Koch announced that tuberculosis is caused by a germ which is to be found in the expectoration of those suffering from consumption. This was the beginning of a new epoch in the treatment and prevention of the disease. With a knowledge of the cause it would be possible to prevent it to a certain extent. Despair has given place to hope and optimism which means conquest of the "Great White Plague" or at least a great reduction in its ravages.

Today the entire world is organized to combat tuberculosis. Thousands

of men and women in all portions of the globe are enrolled in the great campaign against it; they are giving their time and money to the cause and yet it seems that most of the energy is being expended in overcoming the results of the disease rather than in removing the cause.

To successfully combat any disease we must know the cause and the mode of its transmission from person to person, and must remove the cause and close the channels of transmission.

The causes of disease may be divided into exciting (direct) and predisposing (indirect).

The direct cause of tuberculosis is a bacillus which is found in the expectoration and other discharges of those who have the disease, depending upon the location of the infection. It is also found in the milk of cows which have the disease, and in the flesh of tubercular cattle, hogs and other animals. The dust in our houses and that of the public streets contains many of these germs. Probably every one of us breathes or swallows a large number of tubercular bacilli every day, but nature has provided the healthy body with means of overcoming this invading host or no one would escape the disease.

The indirect causes are impure air, lack of sunshine, dampness, overcrowding, dissipation in any form, working in a dust-laden air, poor food, the sweat shop and the tenement. These lower the vitality of the body so that the tissues are no longer able to overcome the invading bacilli and so the body becomes infected. These causes operate more actively in the great centers of population than in the sparsely inhabited districts.

Tuberculosis can be transmitted to man through the medium of infected milk or food, but more especially by the inhalation of the germs in the minute droplets of mucous which are expelled from the mouth during the act of coughing. The breath of a consumptive is in no way a danger to the community or those with whom he associates.

Dr. L. F. Fleck (1) in a recent paper gives the following as the essentials in the crusade against tuberculosis:

1. Control of infection.
2. Disinfection.
3. Life in the open.
4. Proper food.

In the great campaign, which has enlisted so many enthusiastic workers, and which is rendering such service to mankind, attention has been directed largely to the first and second of the above propositions, and the question of procuring better food and pure air for the poorer of our people has not received the attention that its importance demands.

In this paper it is not intended to consider the prevention of the disease in all of its phases, but rather to dwell upon environment as a cause, for unless we, in our endeavors to combat tuberculosis, make radical improve-

ments in the housing and feeding of the less fortunate of our fellow beings we will accomplish no lasting benefit to the nation nor to those who are exposed to the disease. Should we be so fortunate as to reduce the ravages of tuberculosis to the insignificant number now claimed by small pox, some other disease would take its place. Pneumonia is already a strong candidate for the position of "Captain of Death."

The following table shows the death rate per 100,000 from tuberculosis of the lungs in the urban and rural districts of the registration area of the United States as shown by the returns of the Census Bureau for the ten years ending with 1909:

	Urban.	Rural.
Connecticut,	156	117
Indiana,	174	148
Maine,	162	128
Massachusetts,	162	157
Michigan,	100	80
New Hampshire,	146	122
New Jersey,	183	128
New York,	194	124
Rhode Island,	181	155
Vermont,	144	126

Not only is the death rate from tuberculosis greater in the cities but the reports of the Census Bureau show that for the ten years ending with 1909 the death rate from all causes was higher in the cities than in the rural districts, the rates being 17.0 per thousand in the cities and 13.8 in the rural districts. There are a few diseases which are more prevalent in the rural districts, the principal one being typhoid fever.

Dr. E. E. Graham of Philadelphia, in an elaborate study of the infant mortality states (23) that epidemic diarrhea (the principle cause of death in young children) is a disease of large towns and cities.

We have seen that disease and especially tuberculosis is more prevalent in cities; let us see if there is anything in the city air that may help to account for this. Observations taken in Paris have shown (11) that there are on an average 4,790 bacteria to the cubic meter of air in the center of the city, while at the Observatory of Montsouris in the suburbs there are but 345 per meter.

Aitkins (12) found the average number of dust particles per cubic inch of air in the country to vary from 8,000 to 100,000 while in the city the figures were found to be from 1,000,000 to 50,000,000. The dust in the air of cities is largely composed of soot. It has been estimated that London burns about 30,000 tons of coal per day and generates therefrom 300 tons of soot.

Dr. J. B. Cohen, speaking of smoke producers, says (14): "The smoke banners which fly from their chimneys are the black flags of piracy. They are pirating the pure air which is the property of every one."

The dust and smoke in the atmosphere has a direct effect upon the lungs of those who breathe it. Autopsies have shown that the lungs of the dwellers of cities are darker than those of persons who reside in the country. This difference is due to the deposit of carbon (soot) in the tissues surrounding the air cells. In time this lowers the vitality of the tissues and so predisposes to tuberculosis and other diseases.

Laboratory studies have shown that the condensation of vapor takes place very slowly in a dust-free atmosphere even though the temperature be reduced far below the point of condensation. A certain number of dust particles appear to be necessary to furnish nuclei around which the condensation takes place. The conditions which obtain in the atmosphere of our large cities is exactly the opposite from the dustless chamber of the experimentor and the smoke and dust are largely responsible for the mantle of fog which hangs over so many large cities. In London the number of days of fog has increased from 51 during the five years ending with 1875, to 74 during the five years ending with 1890 (13).

There is also a chemical difference between city and country air. Angus Smith examining the air in Dundee at night found the carbon dioxid in the center of the city to amount to 0.042, while in the suburbs at the same time the amount was 0.028. Burning coal not only produces soot but also generates sulphurous gases which, combining with the watery vapor in the air, makes acids which irritate the mucous membrane of the breathing apparatus, and also destroy the stone and iron work of buildings. The air in the town of Leeds, England, was found to contain 11.6 milligrams of SO^2 per 100 cubic feet of air, while in the outskirts the amount was 5.5 milligrams (12).

In large cities there is always more or less pollution of the air by illuminating gas. In London, during six months of 1908, 110,000,000 cubic feet of gas leaked from the mains (16). This contains carbon monoxid which is highly poisonous.

It is said that "Buffalo Bill" was struck with the resemblance between the streets of New York and the cañons of the West, and is said to have first called Broadway, "Broadway Cañon." He was not far from right for there is but a difference in name; both have precipitous walls which exclude the sunlight, and from a sanitary point of view the cañon is the better of the two. Sanitation requires that no building should be higher than the width of the street on which it is situated, but in most American cities a much greater height is allowed, and in New York and other of the larger cities there is no limit to the height of buildings.

In this respect we are certainly far behind the cities of Europe where there are strict regulations limiting the height of buildings. There is, however, a movement on foot in New York to have such regulations enacted, but one of the most influential papers in the country is actively

opposing it. One of the greatest objections to tall buildings is that they cut off the sunshine from the streets and from the opposite houses. Sunshine is one of the most efficient disinfectants and the lack of sunshine is one of the factors which causes the increased mortality in large cities.

There is a great difference between the amount of sunshine in the city and that of the suburbs. The average number of hours of sunshine for the year in London is 1,026, at Greenwich it is 1,227, and at Kew just outside the city the number is 1,399.

The death rate increases with the density of the population which is shown by the following table which Kober (4) of Washington quotes from Rohe:

	Mean number of inhabitants to each home.	Average annual death rate per 1,000 inhabitants.
London,	6	24
Berlin,	32	25
Paris,	35	28
St Petersburg,	52	41
Vienna,	55	47

Kober also states (17) that in certain cities in Europe there are laws fixing the maximum density of population. Such laws would be most beneficial in this country.

Tuberculosis is largely a house disease of the large cities, and is more prevalent where people are crowded together in badly ventilated buildings. In New York state the incidence of the disease in large cities is twice as great as in the rural districts.

Lilian Brandt, who has analyzed the statistics of tuberculosis for the Charity Organization of New York City, says (18): "All those occupations with a noticeably high mortality from consumption belong primarily to the cities and large towns, while among those with a consumption death rate below the average of 2.4 per 1,000 are found almost all that are carried on in small towns or the country." She also presents the following table which shows the death rate from consumption per 1,000 according to occupation (24):

Occupation.	Death rate.
Laboring and servants,	3.8
Clerical and office,	3.0
Public entertainment,	2.7
Manufacturing and mechanical pursuits,	2.6
Personal service, police and military,	2.5
Professional,	1.8
Mercantile and trading,	1.7
Agriculture, transportation and other outdoor pursuits.	1.5

Dr. R. H. Babcock of Chicago says (2): "Brave-hearted, philanthropic men and women are battling against this terrible disease (tubersulosis), but their efforts will be in vain as long as the vile tenements and sweat shops are tolerated in our midst."

Dr. John R. Walker (3), who has made a study of tuberculosis amongst the Oglalla Sioux Indians has shown that the Indians suffered but little from tuberculosis while living in tepees, but that the mortality began to increase as soon as they built houses. The difference being that the tepees were better ventilated and were moved as soon as the ground became filthy, while the houses are badly ventilated and soon become filthy, but cannot be moved.

Dr. S. A. Knopf (5) estimates that in 1900 over seventeen millions of the American people were engaged in indoor occupations, and that counting all the time spent indoors the greater part of the people pass their lives indoors.

If these statements be true, and there is no reason for believing otherwise, it would seem that the question of housing should be of the greatest importance in the prevention of tuberculosis.

The housing of the working classes in our large cities is a disgrace to the nation. Crowded into tenements where the streets are narrow and badly kept, a large number of them occupying rooms that are badly ventilated or without ventilation, many of which are entirely dark, they live in the most favorable environment for the development of tuberculosis.

Not a few of our people think the housing problem has been settled and that with the Tenement House Commission, and the Factory Inspectors, all that can be done is being done. A careful study of the subject will convince at once that, although these agencies have done much, there is much more to be done. In New York City there are 356,000 dark rooms without windows which are occupied by more than 300,000 persons. There are also in the largest city in our country several thousand open sink privies in the tenement house district. These conditions are being remedied very slowly and at the present rate it will be over fifty years before all the dark rooms in New York are abolished.

The Committee on Congestion of Population (New York) found (7) that in one block in the lower portion of the city 34 per cent. of the families occupied two rooms and that 18 per cent. occupied one room. One sixth of the rooms in the block housed four adults. The great majority of the families were paying 25 per cent. of their income for rent and some paid more than 50 per cent.

Dr. Antonio Stella (7), investigating the condition of the Italian population of the city of New York, says: "On Third Avenue, near Twenty-sixth street, a family of eleven—four adults and seven children—and three clerks were living in a dark middle room, and a large bare rear room, an average of seven people to the room. In the section of the Bronx, bounded by East 148th and 153d Streets, Morris, Courtlandt and Park Avenues, I found some of the very worst conditions. In a rag shop on Morris Avenue there were no less than eighteen people, men and women, working, eating,

and sometimes sleeping in a double, new-law tenement. In this section I found 1,100 people, divided in 130 apartments not counting all the night lodgers."

Such crowding of persons of both sexes is not only insanitary but degrading and Doctor Stella has called attention to the rapid spread of venereal disease amongst these people. According to his observations many of those infected are innocent of any crime, the disease being contracted through sleeping in the beds that have been occupied by infected persons or by using their linen or towels.

Doctor Stella says that the Italian children of New York City are not as robust as those brought up in the rural districts and that the proportion of the Italian recruits rejected in New York City is greater than in Italy. Many of the Italian women born in New York are sterile. All of these defects he attributes to bad housing and lack of proper food.

The late Professor Harrington of the Massachusetts Board of Health said (22): "It is well known that a large percentage of the deaths among people whose working days are spent within the walls of industrial establishments is due to consumption." Statistics from the Henry Phipps Institute of Philadelphia show that "houseworkers, mill workers, factory workers, cigar makers and weavers supply vastly the majority of cases" of *tuberculosis.*

Such persons are poorly paid and work long hours in factories which are generally badly lighted and poorly ventilated, and in many cases after the day's work is over spend their leisure and sleep in much worse surroundings. It is but natural that such persons should resort to the saloons which are warm and brilliantly lighted, where there is company, and they are welcome as long as they spend something. Such a life predisposes to tuberculosis and if the disease is to be eradicated particular attention must be paid to this class of persons and the sanitary condition of their homes and working places must be improved. How best to do this is a question which should receive the careful consideration of every factory owner.

The average duration of a case of tuberculosis is about two years, during which time the work turned out is not up to the standard so that the disease causes a loss to the employer as well as to the employee.

There have been many honest efforts to better the condition under which the working population is housed. About ten years ago a number of citizens of Washington organized the Washington Sanitary Improvement Company for the purpose of constructing homes for the working classes of the National Capital. They adopted the two-family house plan, one apartment above the other, each having a separate entrance, bath, toilet, and yard. The rents were so arranged that after deducting operating expenses there would be a 5 per cent. dividend. So far they have constructed two hundred houses, all of which are rented. A novel feature of their plan is to allow the tenant all of the twelfth month's rent that is not re-

quired for repairs. This insures permanence of tenants and a minimum of damage to the property. During the year ending March, 1906, the apartments were occupied by 778 adults, and 380 children, a total of 1,158 persons. There were 39 births and 8 deaths, a death rate of about seven per thousand, while the general death rate amongst the whites of the city was 15 per thousand.

In our campaign against tuberculosis and other diseases we have, to a large extent, adopted the "soup-house" plan. Free medical treatment and free food and clothing can be had in almost any city, but fresh air is not to be had in many of our cities. Dr. L. R. Williams (6) is authority for the statement that there are about 800,000 persons in New York City who never escape beyond the confines of the city. In 1903 over thirty-three thousand persons were sent out of the city for seven days' fresh air.

It is my opinion that the only way we can make any permanent headway against tuberculosis is to scatter the population that is now congested in the large cities. This can only be done by removing the establishments in which they work to the rural districts. I am well aware that this is a radical departure and in direct opposition to the trend of business and that it is often difficult for factories situated in the rural districts to obtain workmen. There are, no doubt, other disadvantages, but to offset them are the lower rentals, cheaper land, lower taxes, and greater and above all the saving of human life.

This is not a matter for the factory owner alone, but also one in which the workmen should coöperate. The labor unions should use their influence to induce workmen to avail themselves of the opportunity for living in the country and the labor leaders should endeavor to supply the factories that are situated in the rural districts with the most skilful and reliable workmen. Despite what may be said to the contrary, I am convinced that there is no valid reason why a large majority of the factories in New York City and other cities should not be moved out into the surrounding country. Move the factory to the country where the workers can be well housed in cottages, where he can have flowers and vegetables in his yard and above all where his children can have pure air and grow up amidst the green grass and the trees. Here there will be fewer temptations and better citizens will be produced.

The ideal factory from a sanitary standpoint would be located in the midst of a park, surrounded by trees, through which should run wide streets lined with the cottages of the workmen. This may not appeal to the average employer and many will say that it would not pay. One manufacturer, whose friendship I prize highly and who has made a business success by his own efforts, tells me that such a movement would be a failure, that the trend of business is towards the cities. Yet, I believe, that the same spirit which made him succeed in his business in the city would have

made him successful under the conditions which obtain in the country. A great deal of the manufacturing in New England is done in the small country places.

The success of the Sanitary Improvement Company in Washington has shown that there is money to be made in housing working people in good buildings and this will add not a little to the receipts of the factory which moves to the country.

Prof. J. Van Pelt, an architect of New York (10), has planned a cement cottage of eight rooms for working people, which can be built for $3,000. To net 6 per cent. this would have to rent for $15 per month, which would allow 4 per cent for dividends and 2 per cent. for sinking fund and repairs. If the Washington plan of remitting all of the twelfth month's rent not required for repairs were adopted the damage to the houses would be very small.

It is true that there is a steady stream of men and women from the rural districts pouring into the great cities. They leave their homes to escape the monotony of country life and because they have before them the example of other country-bred men and women who have been successful in the great centers of population. Some do, indeed, become great and many of the greatest of our citizens have come from the country districts, but the great majority of these emigrants will be lost in the maddening rush of the city life and never attain anything at all.

Dr. F. A. R. Russell of London (19) is authority for the following statement: "As a matter of fact, it has been ascertained that very few families survive in central London for more than four generations, and many die out in three generations. A true Londoner of the fifth or even the fourth generation is rare. A large proportion, probably the majority, lose the fine stock of health they brought with them from the country within two generations."

Each year a few of the city dwellers move to the country. They are mostly men in advanced years who have been successful in life but who find the confinement of the city too much for them and move to the freer life of the country. The editor of *American Medicine*, discussing the question of the location of colleges, says, "City life is very deadly to the young," and advises that colleges be located in the country saying, "Send the boys out of the city." President C. W. Eliot of Harvard University is authority for the statement that many schools are springing up on the outskirts of our great cities, that draw their patronage from the dwellers of the city who have found that it is impossible to obtain proper healthy surroundings for their children in the large cities.

Hon. Charles E. Hughes, governor of New York, says (20): "The man who regards with sullen indifference the congested life in our great city, who is content to pleasantly wrap himself in the garments of prosperity and think of his fellow creatures as ignorant and disorderly masses with

whom he has nothing in common, has but small right to pride himself upon the valor of his Revolutionary ancestors or talk of his patriotic devotion to his country."

Those who do not agree with me regarding the necessity of moving the population from the congested districts will at once call to mind the large parks recently established in many of our cities. To them it will seem that these breathing places are ample for the people, but they are not. In the first place there are too few of them and the air is the same polluted mixture that is to be had in the surrounding streets. Another objection is the "Keep off the grass" signs. I now have in mind a large park in one of the eastern cities which, in the days I first knew it, was a bare common always filled with children. It looked bad to the æsthetic eye and the recent movement to beautify the city has caused it to be planted with grass and shrubs and provided with winding walks, but alas, the playground of the children is gone, and they must stay on the walks.

If the city air is good why do we send out children to school in the country, and why do we leave the city in the summer for a sojourn at the seashore or in the country? If you wish to test this question spend July, August and September in New York City. Take a room in a small hotel or boarding house on a side street, and spend the evenings walking through the region east of the Bowery. It will be a lesson that will never be forgotten. There you will see a mass of human beings filling the streets and sitting on the steps gasping for a breath of fresh air. More than once will the cough of the consumptive attract the attention and you will hear the cry, "Breath —breath—give me breath," uttered by some person in the last agony of tuberculosis.

This is an appeal to the patriotic citizens of the country, the employer of labor, to the laborer, and to those who obtain their living by the labor of others to do what they can to better the condition of the workmen of the country, especially those who are unskilled. This is a patriotic duty. Under the present conditions we are rearing a race of degenerates who will some day make trouble for the country, besides many innocent persons are being murdered by the foul air and the bad food they obtain in our large cities. We are becoming a very patriotic people in that we have many societies which commemorate the deeds of our forefathers. In all of the older cities there are many tablets marking spots sacred in the history of the country. Boston is literally placarded with them. All this is solemn mockery when within sight of these inspiring monuments there are thousands who are being starved, and degraded by our greed for riches and the comforts which they can bring us.

I ask the readers who are owners of stock in business enterprises to learn something of how the workers in the business are living. Use your influence to obtain for them shorter hours, better surroundings, and a fair

share of the profits of their work. Do this and you will be helping to eradicate the "Great White Plague." Such a policy may reduce the dividends of the company but you can made it up by saving what you have been giving to charity and to educate the heathen. Help to make our people independent, and strive to prevent them from becoming pauperized by accepting charity.

Those who are in business for self remember that you are the guardians of the health of those who toil for you and take a real interest in their physical welfare. Be liberal with their allowance of vacation. If your children need three months in the country and you find it necessary to spend the summer in the suburbs how much more do your employees and their children who live in the crowded portions of the city need a vacation. When you see one of your employees looking badly give him a vacation and if needs be turn a deaf ear to the man who asks your aid for foreign missions.

I have before me an appeal from an officer of the army calling upon the American people to vote more money for guns and soldiers to provide for a remote possibility of war. If these are needed let them be forthcoming, but also let us have liberal appropriations and laws with which to combat the enemy (tuberculosis), which is now in our midst and is destroying over two hundred thousand of our citizens each year. Tuberculosis is sapping the strength of the nation and the conditions which predispose to it, and against which I ask your united efforts, are also those which predispose to crime and degeneration. No nation can continue unless its citizens are strong, healthy, and clean in body and mind. Ruskin says: "The strength of the nation is in its multitude, not its territory; but only in its sound multitude." Guns and warships are valueless unless manned by men of brains and strong muscles. The weakling will find no place in our military or commercial warfare. Therefore, let us build up the race by removing the causes of degeneration so that our citizens may be able to fulfil any demands made upon them. I believe that the prevention of disease, especially of tuberculosis, is a national duty and comes within the meaning of the portion of the Constitution which says "to provide for the common defense."

The purpose of this paper is not to condemn any one but rather to ask your coöperation in the endeavor to eradicate the "Great White Plague."

The ills from which the country suffers are not to be charged to any one person or any group of persons but rather to the whole people, for they alone are responsible for the laws under which we live and for their inforcement.

This is a plea for charity, morality and temperance in the highest sense that these terms can be used.

Charity which has not fulfilled its mission by giving food and cast-off

clothing to the less fortunate, but a charity which strives to make our people independent of the "soup kitchen" and the relief station.

Morality which goes beyond our own selfishness and aims at the uplifting of the degraded by providing them better environment and by removing the cause of their degradation and accomplishes results, not by the enactment of laws with penalty clauses attached, but by the education of the people to do what is right because it is right.

Temperance which goes beyond the question of drink, and aids us to use moderation in all things, especially in eating, drinking and in dressing. Many who do not drink to excess are intemperate in their food and dress. It is just as bad to pay an excessive price for a hat or a coat or a dinner as it is to drink or eat more than is good for us. Many and many a man and woman has been ruined by extravagance.

For the sake of humanity let us stop this extravagance which makes so many live beyond their means, and which causes a continual war between the employee and the employer, which beats down wages and runs up prices and swells the mortality bills from tuberculosis.

Each of us has his part in the great crusade against tuberculosis, depending in magnitude upon our social and financial standing, but there is something for each one to do.

Let us bring into this work the "Spirit of Christmas, Peace on earth good will towards men." A spirit which will make us a happy nation and will abolish the slums and banish tuberculosis from our land.

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THE RELATION OF WATER TO CHRONIC INTESTINAL TRACT INFECTION.

NICHOLAS S. HILL, JR., AND LEON R. WHITCOMB.

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One of the common if not the most common result of chronic intestinal tract infection is auto-intoxication. It is not the purpose of the authors to present a history of auto-intoxication, but rather to outline its effect upon the body and to suggest that one cause of auto-intoxication may be the constant drinking of impure water. If this hypothesis is true, then we have found one rational explanation for the increased human resistivity following the substitution of a pure water for a polluted water and, therefore, the cause for the decrease in the general death rate following such a change.

The symptomology of auto-intoxication which is presented here is drawn largely from the works of Mechinkoff, Dr. A. Combe of the University of Lausanne, Switzerland, and Dr. C. A. Herter of Columbia University, New York City.

AUTO-INTOXICATION AND ITS EFFECT ON THE GENERAL HEALTH.

Dr. Combe defines intestinal auto-intoxication as the toxæmia caused by qualitative or quantitative alterations in a normal digestion. By normal digestion is meant the digestion of a normal man produced by the enzymes or bacteria in the stomach and intestines. Auto-intoxication may also be defined as a toxæmia caused by poisonous substances which are formed through the influence of the vital processes of the body. Such substances are termed "toxic substances" or "toxic compounds."

The digestive enzymes present in the stomach and intestines during the process of digestion convert starch into sugar, emulsify fats, and transform nitrogenous material into albumen, peptones and crystalline bodies. There are some bacteria usually present in the intestines which are also capable of doing the same things. As Doctor Combe points out, it is this constant intervention of the bacteria in the process of digestion that permits us to consider it a normal process of the body. Certain classes of bacteria perform a legitimate function in the process of digestion, and while their presence may not be absolutely necessary, yet under normal conditions their presence is at least not detrimental. Under certain conditions, however, the bacterial action is extended to the production of hydrogen

sulfide, lactic, butyric, propionic acids, indol, skatol, phenol, paracresol and other substances derived from the processes of fermentation and putrefaction. These compounds may be produced by the introduction of bacteria not normal to the intestines, but which, when planted there, gain a firm lodgment and carry on the work of putrefaction. The toxic compounds may also be increased by an increase in the number of bacteria normal to the intestine. In fact, any bacterial condition in which the number, varieties and microbic associations overbalance those influences provided by nature to prevent the formation of toxic substances detrimental to the human organism may produce auto-intoxication.

The substances introduced as food into the alimentary canal which are most susceptible to putrefaction are the highly nitrogenous compounds. It is the aromatic bodies produced by the action of bacteria upon these proteid matters which cause auto-intoxication. These products, some of them but slightly poisonous individually and in the quantities normally present, when present in excessive quantities produce the most deleterious effects upon the human system. Fortunately, the body is capable of gradually accustoming itself to the presence of these toxic substances and even organizes means of defense against them.

The ability of the human organism to adjust itself to the presense of toxic substances derived from the intestines is limited, and it may be overcome by the formation of excessive quantities of the toxic compounds. It is also impaired by other means, such as a severe cold, by overwork, or by some disturbance of the nervous system. It also varies greatly with the individual. Some people can apparently eat anything and drink everything and still escape the penalty imposed by nature. Others lose the defensive power on the slightest provocation. A child is much more susceptible to auto-intoxication than an adult, as is instanced by the severe cases of auto-intoxication in children, following slight diatetic indiscretions on the part of the nursing mother, or the change of food of a cow from dry feed to green fodder. In fact, any condition which tends to exceed the adjusting power of the body causes auto-intoxication.

The kind of bacteria in the intestines depends largely upon the nature of the food. If the diet consists largely of milk, as in the case of young children, the flora of the intestines will be very nearly that of the milk, and will consist of very few varieties. As the diet becomes more and more varied, the flora will rapidly increase in number and in the varieties present. The nature of the diet, however, will always modify the intestinal flora. Other conditions which influence the character of the bacterial action in the intestines are:

1. Impaired gastric digestion (gastric stasis).
2. The relative solubility of the food in the digestive juices.
3. Any condition retarding the passage of the food through the intestine

(intestinal stasis). (The longer the period during which the food is retained in the intestine, the greater the opportunity for putrefactive processes to take place.)

4. Impaired intestinal absorption of protein, and, lastly,

5. The percentage of water present. When the matter in the intestine is very dry, bacterial growth is hindered. Therefore, the putrefactive action is reduced.

There are, then, conditions very favorable to the formation of toxic substances. They may be outlined thus:

Reduced quantities of gastric juices in the stomach.

Dilution of these juices by water or other fluids taken with the food.

The use of food rich in proteids and low in carbohydrates.

The use of food or drink containing large numbers of anearobic bacteria.

The retention of the food by the intestines for too great a period of time.

It is not necessary that all of these conditions occur at the same time. Any one may be sufficient to create anearobic decomposition in the intestines.

The body is provided with means to prevent large increases in undesirable bacteria in the intestines or the passage of these bacteria (or the toxic substances which they produce) from the digestive system to the circulatory system. These defenses, as most of you know, are:

1st. The acidity of the stomach.

2nd. The presence of acid producing bacteria in the intestines.

3rd. The action of the mucosa cells.

4th. The liver.

5th. The internal secretive glands.

In order to reach the large intestine, bacteria admitted in food to the mouth must pass through the stomach, and under usual conditions, remain in the stomach for a period of time. Here they are subjected to the action of the stomach fluids which are acidified with hydrochloric acid. Since most vegetative forms of bacteria are destroyed by hydrochloric acid a small per cent. of the number of bacteria entering the mouth ever reach the intestines under normal conditions. If, by some derangement of the digestive system, the stomach contents become weakly acid or alkaline, increased numbers of bacteria are permitted to enter the intestines directly. Liquids, such as milk or water, for example, dilute the stomach juices and also pass through the stomach rapidly. Thus it is possible even in the normal condition of the stomach for large numbers of bacteria to pass into the intestines.

When the bacterium reaches the intestine, it must begin at once a battle royal for supremacy over other varieties of bacteria. It must align itself with one of two groups, the putrefactive group, or the lactic acid producing group. Some bacteria, however, are capable of joining either group, and

will align themselves with the group which appears to predominate. For example, bacillus coli is capable of living ærobically and producing acid or of living anærobically and aiding in the putrefactive processes. The change from the acid condition of the intestine to a putrefactive condition depends mainly on the nature of the food supply. Substances rich in sugar, which on decomposition produce acid easily, such as milk, assist in the maintenance of the acid condition of the intestine. Other substances, such as meat which takes up oxygen, produce anærobic conditions, and assist in the production of putrefactive conditions.

When the acid producing bacteria predominate in the intestine, and the contents of the intestine are therefore acid, there is little opportunity for auto-intoxication, since the toxines causing the disturbance can only be produced under strictly anærobic, putrefactive conditions. It is, therefore, only with these latter effects that we are interested in this discussion. If, for any reason, the putrefactive organisms predominate in the intestines, toxic substances, such as indol, skatol, putrescin, cadaverin, methyl mercaptan, may be formed.

If unprevented, these toxines, together with the bacteria themselves, will enter the portal vein and eventually the circulatory system. Under normal conditions, however, they do not reach the major circulatory system. They may be absorbed or rendered inactive by the eipthelial cells of the mucosa, or by its excretions. They may be retained and destroyed by the toxicolytic power of the liver. They may be destroyed by the antitoxic action of the excretions of the intestinal glands, thyroid gland, pituitary body and suprarenal capsules. No one of these agencies necessarily performs the entire work of destroying the toxines, but each does a part. In some cases the mucosa may be particularly active; in others, it may be the liver or the glands. When one defense begins to fail, the others are forced for a time into greater activity. Under conditions of prolonged abuse, or overwork, the cells of the mucosa lose their neutralizing power. The hepatic cells of the liver then become saturated with the poisons that they have absorbed and become incapable of further reaction, and, finally, the antitoxic glands become altered and fail to contribute the necessary amount of antitoxin to the blood. It is then possible for the poisonous compounds to pass unchanged from the intestinal tract into the major circulatory system where they produce various symptoms of disease, according to their nature and quantity. They may affect,

1st. The heart.
2nd. The arterial blood pressure.
3rd. The respiratory system.
4th. The nervous system.
5th. The general nutrition.
6th. The urinary system.

The Relation Between Impure Water and Auto-Intoxication.

Thus far, we have only hinted at the relation between impure water and intestinal tract infection, one of the most important results of which is auto-intoxication. We have stated that among other causes of the breakdown of the defensive organs of the alimentary system is that due to a large increase in the putrefactive bacteria entering the intestine in the food. We shall not attempt in this paper to ascribe this putrefactive action to particular forms of bacteria because this phase of the question has not been studied sufficiently to include at this time all of the bacteria which may be directly or indirectly associated in the reactions producing auto-intoxication. It is sufficient to state that, as a general thing, the authorities consulted concur in the belief that the anaerobic bacteria are chiefly concerned and that the anearobic bacteria most prominently mentioned have been of the spore forming variety, included in which are the B. ærogenes capsulatus, B. enteriditis sporogenes, B. putrificus, B. anarobicus alcaligenes.

In considering the possible effect of polluted water in intestinal tract infections, it must be remembered that the secretion of the gastric juices is most active at the time that freshly digested food is in the stomach and, therefore, while uncooked food may be the most potent factor in the induction of foreign bacteria into the digestive tract, the bacteria thus infested are subjected to the maximum disinfection produced by the gastric juices. When the stomach is idle, the production of gastric juices is very slight and it is under these conditions that water is regularly and frequently taken. It is to be remembered that liquids, and particularly water, pass more rapidly from the stomach to the lower intestines than do solids and, therefore, the time element, which is an important factor in the destruction of foreign bacteria, is materially lessened, and, lastly, that the percentage of water present in the intestines materially influences the character of the bacterial action in the intestine.

If, therefore, the supply of putrefactive bacteria through the agency of water is constant, though small in number, and the diet of the person imbibing impure water is favorable to the putrefactive bacteria, it is not unreasonable to assume that these small numbers will in time, or under accidental conditions, produce anærobic putrefaction and eventually intestinal tract infections and the resultant auto-intoxication.

So long as bacteria which are concerned in chronic intestinal tract infections are evacuated, so long will these bacteria be present in greater or lesser quantities in sewage polluted water, and we have a repetition of the same phenomena which are present in the causation of typhoid fever and other acute gastro intestinal disturbances. As a matter of fact, those bacteria which have been most prominently mentioned in connection with

chronic intestinal tract infections, and which are generally of the spore forming variety, have frequently been isolated from the water supplies of various cities.

Nearly everyone in the medical world today is more or less familiar with the theorem formulated by Hazen and the so-called Mills-Reincke Phenomenon. Mr. Hiram F. Mills, Member of the Massachusetts State Board of Health, and Chief Engineer of the Locks and Canals on Merrimack River, observed that shortly after the introduction of a filtered and purified water supply in Lawrence, there was a marked decrease, not merely in the death rate from typhoid fever, but also from other diseases. At the same time Dr. J. J. Reincke, Health Officer of Hamburg, Germany, observed a similar effect on the death rate of his city following the installation of a purer water supply. From these observations, together with observations made by him in the cities of Troy and Albany, Mr. Allen W. Hazen evolved a theorem which he states as follows: "Where one death from typhoid fever has been avoided from the use of better water, a certain number of deaths, probably two or three, from other causes, have been avoided."

Professor W. T. Sedgewick and Mr. J. S. MacNutt have made further studies of the Mills-Reincke phenomenon and, in addition to the cities above cited, examined the death rates of Lowell and Binghamton and found that following the introduction of a purer water supply in these cities, there was a decrease in the number of deaths due, not only to typhoid fever, but to other causes. They found that the decrease in death rate was particularly noticeable in such diseases as diarrhœa, *cholera infantum*, other *gastro intestinal diseases*, pneumonia, pulmonary tuberculosis and bronchitis. Furthermore, they noted an apparent improvement in the general health of the community, not traceable to the reduction in these diseases.

Of the diseases just mentioned, it will probably be admitted that the causative factor in the production of diarrhœa, cholera infantum, pneumonia and pulmonary tuberculosis may be bacterial. We will venture to state that most gastro intestinal diseases have their origin through the agency of bacteria. It will also be admitted by most that typhoid, cholera, diarrhœa, cholera infantum, dysentery and other acute gastro intestinal diseases may be water borne. There are some who claim that pulmonary tuberculosis may be conveyed through the medium of water. So far as this paper is concerned, however, the most interesting fact here presented is that all of the acute gastro intestinal diseases have, at one time or another, been attributed to water. If this be so, why may not chronic intestinal tract infections be water borne?

Two hypotheses have been suggested to explain the improvement in the general health tone, aside from those diseases which are known to be

specifically water borne. One credits the reduced death rate to the greater human resistivity following a reduction of the organic matter, or filth, in a water supply, but it has never been definitely shown that filth per se, minus infection, will produce disease. Filth may be deleterious and harmful and tend to reduce the vital resistance of the body, but the amount of organic matter, or filth, which may be present in a drinking water, which is inoffensive to the taste and smell, is so small that its pathological significance is minimized, if not eradicated.

The other hypothesis is that the improvement is due solely to the elimination of bacteria which may be causative of disease but whose etiological significance is not now known. We know that the elimination of specific bacteria which are now recognized as the etiological factor in specific disease will reduce specific diseases such as typhoid and cholera. It may be that the removal of many other bacteria not now recognized as the etiological factor in the causation of disease may be accountable for the reduction in the general death rate as noted. As a matter of fact, the flora of the intestinal tract includes many forms and varieties of bacteria which are not at this date associated with disease. The function of these bacteria is not known and the variety of species present in the intestines of man is not probably generally appreciated. In fact, the consensus of opinion of the writers of the present day is that the species of bacteria present in the intestines of man is very limited.

Our studies have carried us into a tabulation of the various species of bacteria which have been isolated from the intestinal tract, or the human fæces, and the results of these findings are included in a table which we present with this paper. In every instance, the name of the authority who isolated the bacterium from the sources mentioned has been given. The classification of the bacteria as presented may be subject to much difference of opinion, as our studies have clearly indicated that there is no well defined method of classifying bacteria and much confusion exists in any attempt at classification. We, therefore, present this table, not for the purpose of formulating a classification, but rather to indicate the great variety of forms included in the intestinal flora.

A study of this table, conjoined with the knowledge that a year seldom passes without establishing the direct connection between a specific disease and a bacterium formerly unassociated with disease, will lead one to concede that many of the bacteria, listed in this table, but not now associated with disease, may possess the potential ability to produce disease. The authors believe that the reduction in the general death rate, following the introduction of pure water, which has been noted, can be attributed to a reduction in bacteria rather than to a reduction of filth. The correctness of this view is supported by a consideration of the relation of bacteria to intestinal tract infections which may not of necessity be acute, as in the case

of diarrhœa, dysentery, enteritis and typhoid, but which may develop a condition of toxæmia which affects the general health tone and thereby increase susceptibility to other diseases, not alone those at present associated with bacteria but those unassociated with them as well.

That there are many cases of intestinal tract infection at the present time which pass unheeded and unnoticed is the consensus of opinion of a number of eminent scientists and physicians who have made a special study of these infections. Chief among the results of chronic infection is the socalled auto-intoxication, which is another name for many forms of indigestion or derangement of the processes of digestion.

It has been found when careful studies have been made that more people are suffering from intestinal tract infection and auto-intoxication than is usually supposed, and we believe, if a careful investigation of the subject were made, it would be found that many people in our congested communities are suffering from this disturbance. When a person is suffering from impaired digestion, affected heart, a diseased condition of the kidneys, or a nervous breakdown, that person must naturally be in a much more susceptible condition toward other diseases. Moreover, the problem of the prevention of disease has only been partially solved when the infections of cholera infantum, dysentery and typhoid fever are broadly checked by modern sanitary measures. There still remains the more elusive task of preventing the recurrence of the severe chronic infections in the digestive tract. The acture infections like dysentery and typhoid are so numerous and obtrusive in their manifestations that it is impossible to overlook them, but chronic infections are obscure in their manifestations and seldom are found in epidemic form. Hence, they pass unnoticed. The injurious effects of the chronic infections are none the less real.

It is not the intention of the authors to ride a hobby or to insist upon a theory to the exclusion of other theories. We have had entirely too much of this in modern sanitation, but it seems wrong to assume that various morbid manifestations are inevitable or inherited. The effects of chronic poisoning of gastro-enteric origin are understood by few persons, for it must not be forgotten that in addition to reduced physical resistivity, these enterogenic intoxications of the nervous system may be extremely detrimental to character and contribute to complicate and mar the finer human relations. They entail a severe economic loss to the communities in which they occur through the partial failure of performance resulting from the reduced efficiency of the individual suffering therefrom.

It would seem that a proper regard for the inestimable benefits to be achieved by any process which will aid in the reduction of chronic intestinal tract infections will add to the significance to be attached to the reduction in the general death rate following the introduction of such a process, and a proper regard for these infections will tend to minimize the

tendency to over-evaluate results achieved by such a process as shown by an individual study of the reduction in a specific disease, such as typhoid. The time has come when the sanitarian should judge of the value of a process, not by the reduction in the death rate along specific lines alone, but also by its effect on the general health tone of the community. A proper appreciation of the importance of the enterogenic intoxications will certainly tend to eliminate the preponderating value placed upon the prevention of epidemics, one might say almost to the exclusion of a consideration of deleterious endemic conditions.

The sanitarian has been so eminently successful in the prevention of epidemic that he should now turn his attention to the chronic affections which so seriously impair the usefulness and comfort of a great portion of our population. It is chiefly for the purpose of focusing attention in this direction that this paper is presented, though the theory outlined suggests a rational explanation for the "Hazen Theorem."

Bacteria of the Intestinal Tract. Bacilli—Non Spore Forms.

Organism	Obligate Anaerobe	Facultative Anaerobe	References
Bacillus coli	O	+	Escherich, als.
bifidus	+	O	Tissier, Recherches sur la flora intestinale des nourrissons.
typhosus	O	+	Zopf, als.
anaerobicus, minutes	+	O	Tissier, 1. c.
acidophibus	O	+	Tissier, 1. c.
exilis	O	+	Tissier, 1. c.
anaerobius-perfacteus	+	O	Tissier, 1. c.
alcaligens	O	+	Petruschky, Cent. Bakt. 1896, Vol. 19, p. 187. Ford, Studies Royal Victoria Hosp., Vol. 5, 1903.
alcalescens (2)	O	+	Ford, 1. c.
pseudo-dysentericus	O	+	Ford, 1. c.
enteritidis	O	+	(Gartner) Ford, 1. c.
galeatophilum	O	+	Ford, 1. c.
entercus (2)	O	+	Ford, 1. c.
plebeins	O	+	Ford, 1. c.
infreguens	O	+	Ford, 1. c.
recti	O	+	Ford, 1. c.
pylori	O	+	Ford, 1. c.
Bookeri	O	+	Ford, 1. c.
cloacae (2)	O	+	(Jordan) Ford, 1. c.
gastricus (2)	O	+	Ford, 1. c.
liquifaciens (2)	O	+	(Frankland) Ford, 1. c.
iliacus	O	+	Ford, 1. c.
chylogenes (2)	O	+	Ford, 1. c.
leporis	O	+	Ford, 1. c.
dubius	O	+	(Kruse) Flügge, Die Mikro-organismen, 1896. Ford, 1. c.
jejunalis	O	+	Ford, 1. c.

Organism	Obligate Anaerobe	Facultative Anaerobe	References
Bacillus germinus	O	+	Revanel, Matzuschita, Arch. f. Hyg., Vol. 41, p. 211, 1912.
devorans	O	+	(Zimmermann) Matzuschita, 1. c.
æropilus	O	+	Matzuschita, 1. c.
tortuosus	+	O	Debono, Centralblt. f., Bakt. Bd. 62 Heft. ¾ Orig., p. 229.
berolinensis, ruber	O	+	Matzuschita, 1. c.
bruneus	O	+	Matzuschita, 1. c.
fluorescenes	O	+	(Zimmermann) Matzuschita, 1. c.
pyocyanes	O	+	Matzuschita, 1. c.
dimiorphus-longa	O	+	Distaso, Centralbl. f. Bakt., Vol. 62, Orig. 6, 1912.
variabilus	+	O	Distaso, 1. c.
acuminatus	O	+	Distaso, 1. c.
longus	O	+	Distaso, 1. c.
pseudoramosus	+	O	Distaso, 1. c.
cornutus	+	O	Distaso, 1. c.
bullosus	O	+	Distaso, 1. c.
lævis	O	+	Distaso, 1. c.

Bacteria of the Intestinal Tract. Bacilli—Non Spore Forms.

Organism	Obligate Anaerobe	Facultative Anaerobe	References
Bacillus thetaiotaomicron	O	+	Distaso, 1. c.
variegatus	O	+	Distaso, 1. c.
oxygenes	O	+	Ford, 1. c.
bienstockii	O	+	(Schröter) Ford, 1. c.
acidiformians	O	+	(Sternberg) Ford, 1. c.
minutissimun	O	+	(Migula) Ford, 1. c.
aerogenes	O	+	(Migula) Ford, 1. c.
duodenale	O	+	Ford, 1. c.
chymogenes	O	+	Ford, 1. c.
havanieuse	O	+	Ford, 1. c.
lutescenes	O	+	(Sternberg) Ford, 1. c.
laterium	O	+	Matzuschita, 1. c.
halvolum	O	+	Matzuschita, 1. c.
limbatum	O	+	Matzuschita, 1. c.
pseudo coli-anaerobic	+	O	Jungano-Distaso, Les Anaerobes, Paris 1910.
ventriosus	O	+	(Tissier) Jungano-Distaso, 1. c.
proeacutus	O	+	(Tissier) Jungano, 1. c.
capillosus	O	+	(Tissier) Jungano, 1. c.
cylindroide	O	+	(Rocchi) Jungano, 1. c.
dysenteriæ	O	+	(Shiga) Chester Detrm. Bact. p. 246.
vesiculosus	O	+	McConkey, Jour. Hyg., Vol. 5, p. 333 and Vol. 9, p. 68.
oxytocus perniciosus	O	+	McConkey, 1. c.
coli-anaerogenes	O	+	McConkey, 1. c.

Organism	Obligate Anaerobe	Facultative Anaerobe	References
Bacillus ilei	O	+	Gillespie, Jour. Path. & Bact., Vol. 1, p. 279.
ærogenes	O	+	(Escherich) Winslow, Science, Vol. 26, p. 675.
acidi lactici	O	+	(Hueppe) Melia Jour. Inf. Dis., Vol. 8, p. 241.
lesagei	O	+	(Trevisan) Lesage, Bul. Acad. Med. Paris, October 1887.
erythrogenes	O	+	Crotenfelt, Fortschritte d. Medizin, No. 2, 1889.
ærobicus	O	+	Klein, centlbt. f. Bakt., Vol. 10, p. 186.
colorabalis	O	+	(Kruse) Flügge, 1. c.
tachyctonus	O	+	Fischer, Deut. Med. Wochensch 1894, No. 26–28.
acetogenes	O	+	Distaso Compt. Rend. soc. Biology, 1911.
disagregans	O	+	Distaso, 1. c.
rigidus	O	+	Distaso, 1. c.
pseudobulgaricus	O	+	Distaso, 1. c.

Bacteria of the Intestinal Tract. Bacilli—Spore Forms.

Organism	Obligate Anaerobe	Facultative Anaerobe	References
Bacillus vulgaris	O	+	(Hauser) Ford, 1. c. Chester, p. 244.
vulgatus	O	+	(Trevisan) Ford, 1. c. Chester, p. 271.
cereus	O	+	(Flügge) Ford, 1. c. Chetser, p. 278.
mycoides	O	+	(Flügge) Ford, 1. c. Chester, p. 189.
brevis	O	+	(Migula) Ford, 1. c.
subtilis	O	+	(Ehrenberg) Ford, 1. c.
anthracoides	O	+	(Hueppe) Ford, 1. c.
arachnoideus	O	+	(Migula) Ford, 1. c.
sporogenes	+	O	Klein, Rep. Med. Off. Loc. Gov. Bd., Vol. 25, p. 171.
perfringens	+	O	(Tissier) Jungano, 1. c.
welchii	+	O	(Welch) Herter, Infections Intestinal Tract, p. 119.
anearobicus alcaligenes	+	O	Debono, 1. c.
sporogenes coagulans	+	O	Debono, 1. c.
putrificus ovalaris	+	O	Debono, 1. c.
fissus	+	O	Debono, 1. c.
regularis filiformes	+	O	Debono, 1. c.
anearobicus tenius	O	+	Distaso, 1. c.
putrificus	+	O	Flügge, Die Mikro-organismen, 1886.
mesentericus	O	+	(Trevisan) Combe, Auto-intoxication.

BACTERIA OF THE INTESTINAL TRACT. BACILLI—SPORE FORMS.

Organism	Obligate Anaerobe	Facultative Anaerobe	References
Bacillus vitalis	O	+	Chester, 1. c., p. 286.
lacteus	O	+	(Chester) Matzuschita, 1. c.
tenius citreus	O	+	Chester, 1. c., p. 273.
angulosus	O	+	Distaso, 1. c.
implectans	O	+	Ford, 1. c.
lacticola	O	+	Ford, 1. c.
vermiculare	O	+	Ford, 1. c.
infantilism	+	O	Herter & Kendall, J. Biol. Chem., Vol. 5, p. 283.
vacuolosis	O	+	Sternberg, Manual Bact. 1892, p. 717.
Sanfilicei	O	+	Sanfelice, Zeit. f. Hygiene, Vol. 14, p. 372.
taveli	O	+	Taveli, Centblt. f. Bakt., Vol. 23, p. 538.
subtiliforme	O	+	Schröter, Pilz. Schles. 1886, p. 160.
simile	O	+	Schröter, 1. c.

BACTERIA OF THE INTESTINAL TRACT. COCCI.

Organism	Obligate Anaerobe	Facultative Anaerobe	Reference Name	References
Classification of C. E. Winslow.				
Micrococci:				
luteus	O	+	M. luteus	(Cohn) Matzuschita, 1. c.
flavus	O	+	M. flavus	(Flügge) Matzuschita, 1. c.
candicans	O	+	M. rosettaceus	(Zimmermann) Matzuschita, 1. c.
anearobicus	+	O	M. anearobicus	Tissier, 1. c.
Streptococci:				
faecalis	O	+	Str. intestinalis	Tissier, 1. c.
pyogenes	O	+	Str. pyogenes	Matzuschita, 1. c.
gracilis	O	+	Str. coli	Escherich Die Dambakterim des Säuglings 1886.
Albococci:				
tetragenus	O	+	M. ovalis	Tissier, 1. c. Escherich, 1. c.
pyogenes	O	+	Staph. pyogenes albus	(Rosenbach) Ford, 1. c.
Rhodoccus roseus	O	+	M. roseus	Matzuschita, 1. c.
Aurococcus aureus	O	+	Staph. pyogenes aureus	(Rosenbach) Ford, 1. c.
Classification of C. E. Winslow.				
Sarcina:				
lutea	O	+	Sar. lutea	(Schröter) Matzuschita, 1. c.
flava	O	+	Sar. flava	De Bary, 1887.
cervina	O	+	Sar. cervina	Stubenrath, Lehman & Newmann, Bakt. Diag. 1896.
Sar. fusca	O	+	Sar. fusca	Gruber, Arbeit, Bakt. Inst. Techn. Hochschule Karlsruhe, I, 1895.
Sar. aurantiaca	O	+	Sar. aurantiaca	(Flügge) Ford, 1. c.

BACTERIA OF THE INTESTINAL TRACT. MISCELLANEOUS FORMS.

Organism	Obligate Anaerobe	Facultative Anaerobe	References
Pseudomonas:			
Pseudomonas ovalis	O	+	(Revanel) Ford, l. c.
aeruginosa	O	+	(Schroter) Ford, l. c.
fluorescens	O	+	Ford, l. c.
monadiformis	O	+	Messea. Riv. d'iegiene, Rome 1890.
pyocyanea	O	+	Gessard, These de Paris 1882.
Microspira comma	O	+	Migula, System der Bakt. 1897.
protea	O	+	Buchner, Sitzungsber. d. Ges. f. Morph. u. Physiol., München, I, p. 21.
Spirillum massauah	O	+	Kruse, Flügge Die Micro-organismen, p. 589.

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THE CROTON BUG (ECTOBIA GERMANICA) AS A FACTOR IN BACTERIAL DISSEMINATION.*

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Cockroaches have long been looked upon with some suspicion as possible carriers of disease and are certainly regarded with much disgust by everybody. If the house fly is such a potent transmitter of infection, why not the cockroach, at least to a large degree? While the house fly is active in the day time, walking upon prepared human food, depositing thereon its load of bacteria, the cockroach is actively engaged, under cover of night, in a similar performance. The two insects by analogy must relate to the transmission of bacteria in a similar manner, *i. e.*, must collect bacteria upon their feet and mouthparts by crawling upon and feeding on filth which may be charged with bacteria and depositing these, while in the act of feeding, upon human food.

The cockroach has biting mouth parts like the grasshopper, hence could not relate to the transmission of disease by direct inoculation as does the stable fly for example, which has piercing mouthparts. If the structure of the cockroach is such that it can pick up bacteria easily, and if it can be shown that the cockroach invades places where contaminating material, for example sputum or excrement is found, then a chain of strong circumstantial evidence could be woven that the roach may be a factor in the dissemination of such diseases as tuberculosis, dysentery and probably typhoid fever. The food habits of the roach are certainly such that there is ample opportunity for the contamination of the food of man.

An investigation of this problem was made, partly in the field, and a series of experiments conducted to this end during the autumn of 1912 in the Parasitology Laboratory of the University of California under the direction of the senior author.

Structural. Comparing the feet and mouthparts of the house fly and the croton bug it will be seen at once that the latter is far less adapted to the collection of filth, inasmuch as the feet, especially, are not so well provided with spines and hairs as are the feet of the house fly. However, the weight of the insect and surface in actual contact with infective material partly compensate for the above structural deficiency.

*This paper was completed before the writers were aware of the work done and published by Longfellow in the American Journal of Public Health, Vol. III, No. 1.

Can the roach pick up specific bacteria? In order to answer this question one of these insects was allowed to crawl over a culture of Bacillus pyocyaneus a green chromogen, in a test tube. The growth on the agar in this tube was not very profuse. The insect was next transferred to a sterile agar plate upon which it was permitted to walk one minute. The roach was then liberated and transferred to a second plate for one minute, and then to a third plate in a similar manner. The agar plates were then incubated for twenty-four hours at a temperature of 37°/C. At the end of this time a good growth of the green chromogen, Bacillus pyocyaneus, had developed on all three plates.

This experiment goes to prove that the legs of the roach are constructed

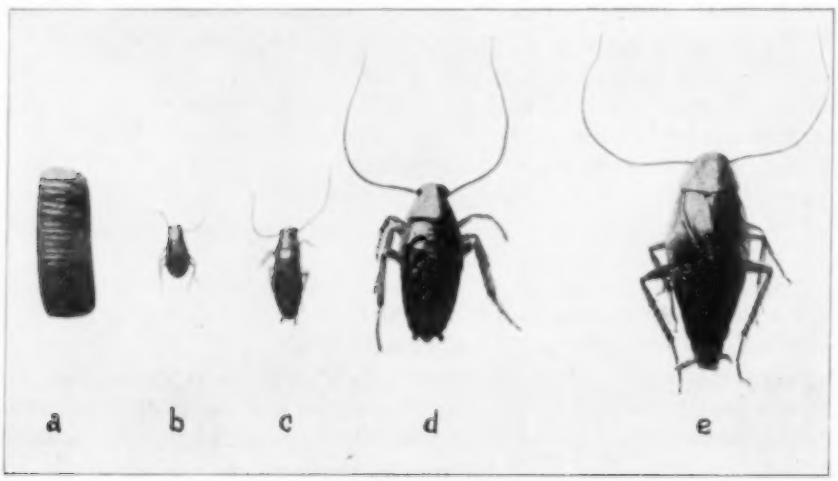

Fig. 1. Showing life history of the croton bug (Ectobia germanica). (a) Egg case or oothecum; (b) and (c) young stages; (d) nearly full grown roach; (e) mature female with egg case partly protruding from abdomen.

so as to enable it to pick up bacteria of a given kind and enough to heavily inoculate three plates.

Can the roach carry specific bacteria to human food? Having determined that the roach can pick up known bacteria, the next thing was to prove that it could deposit these same organizms on human food. In order to do this one gram of sugar was exposed to a cockroach that had previously walked just once over a culture of Bacillus pyocyaneous, the same chromogen used above, on an agar slant. The insect remained with the sugar, feeding upon it, for three minutes. The sugar was then dissolved in 5 cc. of sterile water and plated on three agar plates, using 1 cc. of the solution for each. The plates were incubated for twenty-four hours at 37°/C.

Bacillus pyocyaneus was recovered on all three plates, the growth on none being scanty. The recovery of the test culture in the sugar solution showed that the contaminated cockroach could in turn contaminate the food over which it crawled and upon which it fed.

The bacterial population of the croton bug. Six individuals were taken from a collection of roaches taken from various localities and permitted to

TABLE I.

SHOWING NUMBER AND KIND OF BACTERIA CARRIED ON INDIVIDUALS OF THE CROTON BUG.

No. of the Roach.	Part of the Roach Plated.	Bacterial Count per cc.	Kind of Bacilli Present.
1	Posterior pair of legs	1200+	(a) Staphylococcus albus. (b) Non-spore bearing bacillus.
2	Posterior pair of legs	1600+	(a) Staphylococcus albus. (b) Non-spore bearing bacillus.
1	Remaining legs	950	(a) Staphylococcus albus. (b) Small non-spore bearing bacillus. (c) Spore bearing air bacillus.
2	Remaining legs	1200	(a) Spore bearing air bacillus. (b) Staphylococcus albus.
1+2	Antennæ	384	(a) Spore bearing air bacillus. (b) Staphylococcus aureus. Yellow pigment.
1	Stomach contents	14	(a) Minute bacilli (unidentified).
	Total	5348	for a dilution of 1/5.

5 x 5348 ÷ 2 = 13370 bacteria, minimum number present on each roach.

crawl for one minute over six sterile agar plates (one roach for each plate). These plates were incubated for forty-eight hours at 39°/C. Each plate showed a good growth, the colonies on examination proving to be saprophytic bacilli without exception.

To secure an approximate estimate of the number and kind of bacteria carried by roaches two of these insects were treated as follows: After sterilizing pipettes, forceps, tubes, etc., 5 cc. of distilled water was placed in each of the five test tubes. Into these tubes were placed the legs and antennæ of the roaches,—the posterior pair of legs of one roach into one

tube, those of the other roach into a second tube, the antennæ of both roaches in a third and the remaining pairs of legs of the first roach in the fourth and the remaining pair of legs of the other roach in the fifth tube. The stomach contents were plated on agar. The tubes were shaken vigorously for three minutes in order to wash the parts well and then 1 cc. of the water in each tube was plated on agar and incubated twenty-four hours at 37° C. The results were all positive as the accompanying table (P. 931) indicates.

From the preceding table it will be seen that each roach carried on its feet and antennæ and in its stomach a minimum of 13,370 bacteria. While this does not represent a fair estimate for all roaches, since only two individuals were used, we are here shown that the roach can carry a large number of bacteria along with it. Esten and Mason (Storrs Agric. Exp. Sta. Bull., No. 51) have shown that the number of bcateria carried by a fly range all the way from 550 to 6,600,000, with an average of one and one fourth million bacteria on each. Thus by comparison it may be seen that the roach carries fewer bacteria on the average.

It is furthermore interesting to note that there were more bacteria on the single pair of posterior legs than on the remaining two pairs combined. This is probably explained by the use the cockroach makes of its hinder pair of legs. The tibiæ and tarsi are in contact with the surface on which the insect walks, being parallel with the body. Very often the insect stands on the hind pair of legs, with the remaining legs barely touching the surface. On the other hand, the remaining legs are frequently brushed by the antennæ.

Environmental. The last link in the chain of evidence against the cockroach is its normal environment, giving the insect an opportunity to contaminate itself with pathogenic organisms. Such an environment would be an accessible unsanitary privy close to the kitchen or pantry, in which case there is at least the possibility of the transference to the food of man of the causative organisms (bacillary) of dysentery and diarrhœa, and still more remotely of typhoid fever.

Conditions favoring the transmission of the tuberculosis bacillus are relatively more common. Two instances may be cited. These existed in the forecastle of two vessels. On these two particular vessels there were no separate mess rooms provided for the sailors, and their food was served in the same room in which they slept. The bread, butter and sugar were standing exposed, and cockroaches were to be seen on the floors, walls, and on both the bread and sugar. These sailors were in the practice of constantly spitting on the floor. If one or more of these sailors should be tubercular there is at least the possibility here of transmission by the roach to the food. A third instance may be mentioned of a certain residence in which the croton bug was abundant and in this house there also

lived a consumptive in the last stages of the disease. This patient did not use sputum cups, and although belonging to a refined family had the pernicious habit of spitting in the darker corners of the room and behind pieces of furniture. In this house lived a half-dozen students who also took their meals here. Roaches were commonly seen in the room in which the patient lived and roaches swarmed in the pantry and kitchen at night. Surely here existed a condition that favored the transmission of tubercle bacilli. Unfortunately the reputation of this house in one of the more select districts of the city was of more importance than the lives of the inmates of the house.

Life history and habits of the croton bug. The croton bug is nocturnal in habit, but may be seen roaming about during the day, although their activity is limited. Generally the roaches collect in huddled groups during the day and remain inactive. Their main requirements for activity are first a fairly high temperature, secondly, darkness, and lastly, a supply of food. Roaches are ordinarily encountered in kitchens, galleys, restaurants, bakeries, etc. These insects are omniverous in food habit, favoring starchy and sweet materials; they may also feed on excrement and will readily devour their dead brethren and cast-off skins.

The eggs of the roach are laid in pairs (13 pairs usually) in an egg case or oothecum (Fig. 1) which, when filled, protrudes from the abdomen of the female. The females may evidently carry these cases about with them two months or more when they are finally deposited in some dark crevice and the young roaches and nymphs hatch out in twelve days more or less. The young roaches are at first almost white and transparent but soon become brownish and resemble the adults except in size and for the absence of wings. The young roaches moult their skin soon after emergence from the egg case, and moult a second time in about four weeks. There are apparently about six moults before the roaches are mature and certainly a year or more is required before this is accomplished.

Suggestions for control. Trapping methods are least successful in the control of the croton bug; it is certainly far more wary than the larger species. The ordinary glass jar trap method employed for the large species is not effective. The croton bug can crawl up the sides of a glass jar without difficulty and thus make its escape as well as its entrance. A dark box trap is preferable with one or more tubular paste-board entrances projecting both inside and outside. The mouth of the tube inside the box must be guarded either with a simple trap door or adhesive substance around the outside of the tube and immediately adjacent to the mouth to prevent the roaches from escaping after feeding on the bait. The box may be baited with sugar, sweet chocolate, a little stale beer or the like.

An excellent roach poison can be made by mixing powdered sugar (or sweet chocolate) and borax equal parts. The two ingredients must be

thoroughly well mixed. This material is then placed in little heaps or in vessels accessible to the roaches. Another method of considerable value advanced by several observers is the following: mix thoroughly plaster of Paris one part, and flour three parts, place this mixture in a saucer with a little water readily available. The roaches eat the flour-plaster-Paris mixture for the sake of the flour, drink the water and soon die from the effect of the plaster of Paris caking in the stomach.

Summary.

1. The croton bug, Ectobia germanica, feeds by preference upon the food of man.

2. The croton bug is commonly found in situations where infective sputum or excrement exists.

3. The croton bug is structurally equipped to collect filth and bacteria upon its appendages, though this equipment is not as effective as in the house fly.

4. The croton bug has the ability to pick up specific bacteria on its feet and mouthparts and deposit these on human food, *e. g.*, sugar.

5. The bacterial population of a single croton bug was found to be a minimum of 13,370 bacteria.

6. The croton bug carries more bacteria upon its hind pair of legs than on its middle and fore legs combined.

7. The croton bug is normally nocturnal in habit though it may be active during the day, and are more or less omniverous in food habit.

8. The eggs of the roach are laid in pairs (13 pairs usually) in an egg case which is carried for several months by the female.

9. The young roaches require evidently not less than one year to mature and probably more.

10. The usual trapping methods are not very effective in the control of the croton bug. Sweet mixtures containing borax or flour and plaster of Paris with water available are recommended as good remedies.

Berkeley, California, December 10, 1912.

A STUDY OF THE WATER OF LAKE MICHIGAN.

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The Great Lakes furnish an inexhaustible supply of fresh water for the cities along their borders. In the early days these lakes contained pure water, and the quantity was so enormous that it seemed impossible ever to pollute them to any marked extent by the pouring of sewage and industrial wastes into them. With the development of population, however, and the enormous growth of our cities, accompanied as it was by a tremendous development of industrial and commercial enterprises, the water along the shores has in many places become badly polluted.

The cities situated on the shores of the Great Lakes for the most part discharge their sewage directly into the Lakes, and almost all of them use the lakes as a source of supply for drinking water. In some instances, ledges or rock are supposed to form a safe barrier between the sewage outlet and the water intake. However, typhoid fever and other intestinal troubles have appeared in certain cities with great frequency.

This pollution has been added to by the enormous use of the lakes by ships, passenger and freight. Much of the land along the shores is cultivated, and many head of cattle are pastured in fields bordering either directly on the lakes or on streams running into the lake. Practically every stream which runs into the lake carries sewage from some city, village, or farm. The bottom in the shallow parts of the lake is often disturbed by winds, currents, dredges, and ships. In this way the water, particularly in the neighborhood of cities, has become so changed that it is no longer a safe source of supply. The authorities of most of the towns have been forced to a recognition of the danger by numerous outbreaks of typhoid fever and other intestinal troubles. At first the remedy seemed a simple one, and we find that the intake pipes were extended further from the shore.

The study of Lake Michigan along the Wisconsin shore has been going on at the State Hygienic Laboratory for upwards of three years, our effort being to determine under what conditions the lake could be relied on to furnish a safe water supply. In a general way, this has been done in conjunction with the Lake Michigan Water Commission, and the methods

employed have been the same as used by the States of Michigan, Indiana, and Illinois.

Surveys have been made at Kenosha, Racine, Milwaukee, Sheboygan, and Manitowoc, and it is our desire and expectation to complete the work by making studies at some of the larger cities north of Manitowoc next year. At each city where examinations have been made, an inspection of the water works and sewage disposal system was carried out, together with an investigation of any other possible source of pollution along the shore.

At each city a series of seventy-two samples were collected, the collection lasting over a period of six weeks. Samples were collected at the intake and at points one mile apart up to seven miles from shore in a direction at right angles to the shore line. Collections were made every other day, when four samples were taken; the intake samples came from a depth of thirty-five to forty feet, all others were collected at the uniform depth of ten feet from the surface. Either a tug or a gasoline launch was hired for the collection of the samples, the work of collection being in charge of the local health officer. In a few cases stations were marked by buoys, in others it was decided to run the tug or launch on definite ranges by the compass, using a fixed landmark on shore, and the distance traveled was estimated by the time at full speed. This method was found to be fairly accurate.

The samples were collected in two and one-half liter bottles, and the bottles were well iced before shipment. In all cases care was taken to have the cases delivered to the State Hygienic Laboratory within twenty-four hours from the time of collection. Data regarding the direction of the wind and current, condition of the sea, and weather conditions were taken with each series of samples.

The following chemical and bacteriological tests were made on all samples: Color, odor, turbidity, free ammonia, albuminoid ammonia, nitrites, nitrates, chlorine, oxygen consumed, alkalinity, total bacterial counts on gelatine and on agar, acid colony count, and presumptive and confirmative tests for B. coli. Instead of the usual procedure of inoculating the dextrose fermentation tubes with .1 c.c., 1 c.c., and 10 c.c. respectively, quantitative determinations were made, that is, instead of one tube each for .1 c.c., 1 c.c., and 10 c.c. three tubes with 1. c.c., three with 10 c.c., and one with .1 c.c. were inoculated. In this manner, it is believed, a more precise value of the quality of the water was obtained. In general, the standard methods of the American Public Health Association were followed.

We have considered the physical appearance of the water, because in connection with a water supply, the amount of sediment in the water is of great importance. Modern standards require that a drinking water should be reasonably clear, at all times free from color and disagreeable odor, and fairly soft. Sanitary requirements demand that a drinking supply shall at all times be free from sewage pollution.

The results of chemical analyses indicate that the water of Lake Michigan along the Wisconsin shore is moderately hard, the alkalinity, which is due to carbonates of calcium and magnesium, averages about 111. The ammonias, nitrites and oxygen consumed were usually higher in shore than out, but often high values, indicating contamination, for these determinations were obtained five, six and seven miles from shore. As a rule, the water was free from any decided odor, always free from color, and very low in turbidity. Near shore the water was usually turbid but at one half to one mile or so from shore and at a depth of thirty-five to forty feet, where intake pipes were located, the water was usually free from decided turbidity.

The bacteriological results of the work carried on at each city show occasional relatively high gelatine and agar counts and the presence of B. coli in 1 c.c and 10 c.c. even seven miles from shore, thus showing the effect of wind and current. Near shore, that is from one to three miles, the results indicate that the water is often polluted and that the municipal supplies are frequently more or less polluted.

We give here a series of tables which show both chemical and bacteriological analyses at these different cities. These analyses are selected so as to show some of the best, and some of the worst samples obtained at the different points.

BACTERIOLOGICAL EXAMINATIONS OF LAKE MICHIGAN AT KENOSHA, SHOWING SAFE AND POLLUTED WATERS.

Safe Waters.

Points of Collection.	Gelatine Count.	Agar Count.	B. Coli Present in		
			.1 c.c.	1. c.c.	10 c.c.
Intake	55	2	−	−	−
1 mile east	33	5	−	−	−
2 miles east	35	2	−	−	−
3 miles east	30	4	−	−	−
4 miles east	11	2	−	−	−
5 miles east	18	5	−	−	−
6 miles east	40	6	−	−	−
7 miles east	11	1	−	−	−

Polluted Waters.

Intake	850	18	+	+	+
1 mile east	100	59	+	+	+
2 miles east	220	70	+	+	+
3 miles east	100	30	+	+	+
4 miles east	298	17	−	−	+
5 miles east	1,267	68	−	+	+
6 miles east	1,600	65	−	−	+
7 miles east	1,370	40	−	−	+

CHEMICAL ANALYSES OF LAKE MICHIGAN WATER AT KENOSHA, SHOWING WATERS OF DIFFERENT QUALITIES.

Source of Sample.	Turb.	Odor.	Color.	Free NH_3.	Alb. NH_3.	N'ites.	N'ates.	Cl.	Alk.	Oxy. Con.	T. S.
Intake	0	0	0	0.002	0.052	0.001	0.03	3.1	109.	1.1	148.
1 mile east	0	0	0	0.006	0.098	0.001	0.02	3.7	107.	1.4	140.
2 miles east	0	0	0	0.004	0.072	0.001	0.03	3.7	105.	1.0	145.
3 miles east	0	0	0	0.000	0.086	0.001	0.02	2.3	103.	1.0	140.
4 miles east	0	0	0	0.000	0.090	0.001	0.02	3.0	108.	1.4	146.
5 miles east	0	0	0	0.000	0.072	0.001	0.02	3.0	109.	1.1	140.
6 miles east	0	0	0	0.000	0.070	0.001	0.02	2.3	110.	1.0	138.
7 miles east	0	0	0	0.000	0.076	0.001	0.02	2.3	109.	0.6	135.
Intake	30.	Sl. veg.	0	0.124	0.224	0.002	0.00	6.5	116.	2.8	180.
1 mile east	0	0	0	0.032	0.160	0.002	0.03	4.1	114.	2.9	165.
2 miles east	0	0	0	0.032	0.160	0.003	0.02	4.1	114.	2.9	150.
3 miles east	0	0	0	0.032	0.152	0.002	0.03	4.1	114.	2.1	165.
4 miles east	3	0	2	0.012	0.156	0.002	0.03	30.	111.	1.8	164.
5 miles east	0	Sl. veg.	0	0.040	0.188	0.002	0.02	2.2	109.	1.9	162.
6 miles east	0	0	0	0.020	0.188	0.002	0.02	2.3	109.	1.7	160.
7 miles east	0	0	0	0.036	0.204	0.002	0.02	2.2	109.	1.8	153.

BACTERIOLOGICAL EXAMINATIONS OF LAKE MICHIGAN WATER AT RACINE, SHOWING SAFE AND POLLUTED WATERS.

Safe Waters.

Points of Collection.	Gelatine Count.	Agar Count.	B. Coli Present in		
			.1 c.c.	1. c.c.	10. c.c.
Intake	130	10	–	–	–
1 mile east	38	5	–	–	–
2 miles east	8	1	–	–	–
3 miles east	70	4	–	–	–
4 miles east	45	2	–	–	–
5 miles east	44	1	–	–	–
6 miles east	50	6	–	–	–
7 miles east	12	10	–	–	–

Polluted Waters.

Intake	360	46	–	+	+
1 mile east	765	52	–	–	+
2 miles east	133	80	–	+	+
3 miles east	102	20	–	+	+
4 miles east	900	45	–	–	+
5 miles east	4,500	2,850	–	+	+
6 miles east	645	138	–	+	+
7 miles east	1,050	100	–	+	+

CHEMICAL ANALYSES OF LAKE MICHIGAN WATER AT RACINE, SHOWING WATERS OF DIFFERENT QUALITIES.

Source of Sample.	Turb.	Odor.	Color.	Free NH_3.	Alb. NH_3.	N'ites.	N'ates.	Cl.	Alk.	Oxy. Con.	T. S.
Intake.....	3	0	0	0.001	0.060	0.000	0.03	4.5	101.	1.4	143.
1 mile east....	2	0	0	0.001	0.068	0.000	0.03	4.7	101.	1.4	144.
2 miles east...	4	0	0	0.000	0.064	0.000	0.02	4.7	100.	1.7	130.
3 miles east...	3	0	0	0.000	0.068	0.000	0.04	4.5	100.	1.8	136.
4 miles east...	3	0	0	0.000	0.040	0.000	0.03	4.6	101.	1.6	134.
5 miles east...	3	0	0	0.000	0.068	0.000	0.03	4.8	101.	1.3	135.
6 miles east...	3	0	0	0.000	0.050	0.000	0.02	4.2	101.	1.7	122.
7 miles east...	2	0	0	0.000	0.054	0.000	0.04	4.2	102.	1.8	118.
Intake.....	10	foul	0	0.024	0.196	0.003	0.02	9.1	100.	2.8	159.
1 mile east....	10	Sl. musty	0	0.008	0.532	0.002	0.03	7.1	101.	2.6	150.
2 miles east...	8	Sl. musty	0	0.004	0.116	0.002	0.02	8.4	102.	2.6	164.
3 miles east...	8	Sl. musty	0	0.002	0.118	0.002	0.03	5.7	100.	3.6	164.
4 miles east...	8	0	0	0.010	0.132	0.002	0.02	5.8	102.	6.8	158.
5 miles east...	8	0	0	0.002	0.124	0.002	0.02	6.7	101.	6.9	168.
6 m les east...	6	0	0	0.001	0.092	0.002	0.02	5.8	102.	6.0	170.
7 miles east...	8	0	0	0.008	0.132	0.002	0.02	5.9	102.	4.6	151.

BACTERIOLOGICAL EXAMINATIONS OF LAKE MICHIGAN WATER AT MILWAUKEE, SHOWING SAFE AND POLLUTED WATERS.

Safe Waters.

Points of Collection.	Gelatine Count.	Agar Count.	B. Coli Present in		
			.1 c.c.	1. c.c.	10. c.c.
Intake.....	31	10	–	–	–
1 mile east.....	27	2	–	–	–
2 miles east.....	9	1	–	–	–
3 miles east.....	10	5	–	–	–
4 miles east.....	17	10	–	–	–
5 miles east.....	7	3	–	–	–
6 miles east.....	2	0	–	–	–
7 miles east.....	7	1	–	–	–

Polluted Waters.

Intake.....	2,050	390	+	+	+
1 mile east.....	1,010	335	+	+	+
2 miles east.....	2,280	840	–	+	+
3 miles east.....	675	67	–	+	+
4 miles east.....	156	16	–	+	+
5 miles east.....	146	12	–	+	+
6 miles east.....	92	13	–	–	+
7 miles east.....	125	14	–	–	+

CHEMICAL ANALYSES OF LAKE MICHIGAN WATER AT MILWAUKEE, SHOWING WATERS OF DIFFERENT QUALITIES.

Source of Sample.	Turb.	Odor.	Color.	Free NH_3.	Alb. NH_3	N'ites.	N'ates.	Cl.	Alk.	Oxy. Con.	T. S.
Intake.....	1	0	0	0.004	0.096	0.000	0.03	4.5	106.	1.9	118.
1 mile east....	5	0	0	0.002	0.078	0.000	0.03	4.3	108.	1.6	120.
2 miles east...	4	0	0	0.012	0.066	0.000	0.04	4.3	110.	1.8	129.
3 miles east...	3	0	0	0.008	0.106	0.000	0.03	4.4	106.	2.2	147.
4 miles east...	3	0	0	0.000	0.050	0.000	0.03	4.6	106.	1.2	132.
5 miles east...	2	0	0	0.000	0.048	0.000	0.02	4.2	106.	1.7	125.
6 miles east...	2	0	0	0.000	0.060	0.000	0.03	4.6	106.	1.8	118.
7 miles east...	3	0	0	0.000	0.089	0.000	0.03	4.7	107.	1.8	118.
Intake.....	3	0	0	0.092	0.186	0.002	0.03	6.5	109.	2.9	173.
1 mile east....	3	0	0	0.030	0.184	0.002	0.02	6.5	105.	2.4	125.
2 miles east...	1	0	0	0.092	0.310	0.002	0.02	5.1	106.	2.2	172.
3 miles east...	4	0	0	0.032	0.278	0.002	0.02	5.1	102.	2.4	173.
4 miles east...	3	0	0	0.196	0.160	0.002	0.03	6.7	104.	3.5	202.
5 miles east...	3	0	0	0.036	0.162	0.001	0.03	5.2	111.	2.7	175.
6 miles east...	0	0	0	0.022	0.200	0.001	0.03	5.8	105.	4.6	179.
7 miles east...	3	0	0	0.014	0.230	0.001	0.02	6.8	106.	0.5	163.

BACTERIOLOGICAL EXAMINATIONS OF LAKE MICHIGAN WATER AT SHEBOYGAN, SHOWING SAFE AND POLLUTED WATERS.

Safe Waters.

Points of Collection.	Gelatine Count.	Agar Count.	B. Coli Present in		
			.1 c.c.	1. c.c.	10. c.c.
Intake.....	55	2	–	–	–
1 mile east.....	6	2	–	–	–
2 miles east.....	9	3	–	–	–
3 miles east.....	2	0	–	–	–
4 miles east.....	6	3	–	–	–
5 miles east.....	2	5	–	–	–
6 miles east.....	35	8	–	–	–
7 miles east.....	4	3	–	–	–

Polluted Waters.

Intake.....	37,000	3,000	–	+	+
1 mile east.....	21,000	930	–	–	–
2 miles east.....	4,650	630	–	–	+
3 miles east.....	5,500	765	–	–	+
4 miles east.....	850	95	–	+	+
5 miles east.....	8,880	3,000	–	–	+
6 miles east.....	13,800	711	–	–	+
7 miles east.....	12,500	9,000	–	+	+

CHEMICAL ANALYSES OF LAKE MICHIGAN WATER AT SHEBOYGAN, SHOWING WATERS OF DIFFERENT QUALITIES.

Source of Sample.	Turb.	Odor.	Color.	Free NH_3.	Alb. NH_3.	N'ites.	N'ates.	Cl.	Alk.	Oxy. Con.	T. S.
Intake.....	4	0	0	0.001	0.064	0.000	0.04	2.2	115.	1.5	134.
1 mile east....	4	0	0	0.001	0.082	0.000	0.03	3.1	110.	1.6	148.
2 miles east...	5	0	0	0.000	0.084	0.000	0.02	3.9	111.	1.9	145.
3 miles east...	3	0	0	0.000	0.060	0.000	0.04	3.7	111.	1.8	128.
4 miles east...	5	0	0	0.001	0.082	0.000	0.03	4.2	110.	1.7	125.
5 miles east...	3	0	0	0.002	0.074	0.000	0.03	3.4	110.	1.9	135.
6 miles east...	5	0	0	0.001	0.078	0.000	0.03	4.0	111.	2.1	130.
7 miles east...	5	0	0	0.004	0.078	0.000	0.03	4.0	97.0	2.1	131.
Intake.....	8	Foul	0	0.020	0.920	0.003	0.03	13.7	111.	4.4	156.
1 mile east....	8	Foul	0	0.016	0.162	0.002	0.03	6.8	112.	4.8	130.
2 miles east...	8	Foul	0	0.020	0.212	0.002	0.03	6.2	112.	4.7	160.
3 miles east...	8	Foul	0	0.025	0.260	0.003	0.03	6.6	112.	5.4	193.
4 miles east...	10	Foul	0	0.016	0.172	0.002	0.02	6.7	112.	3.7	168.
5 miles east...	5	0	0	0.018	0.236	0.002	0.03	6.7	112.	3.8	160.
6 miles east...	20	5	0	0.036	0.336	0.003	0.03	13.7	113.	2.8	215.
7 miles east...	6	5	0	0.032	0.180	0.002	0.03	5.5	113.	2.7	173.

BACTERIOLOGICAL EXAMINATIONS OF LAKE MICHIGAN WATER AT MANITOWOC, SHOWING SAFE AND POLLUTED WATERS.

Safe Waters.

Points of Collection.	Gelatine Count.	Agar Count.	B. Coli Present in		
			.1 c.c.	1. c.c.	10. c.c.
½ mile east.....	60	4	.....	−	−
1 mile east.....	80	5	.....	−	−
2 miles east.....	75	3	.....	−	−
3 miles east.....	50	1	.....	−	−
4 miles east.....	46	4	.....	−	−
5 miles east.....	20	0	.....	−	−
6 miles east.....	25	4	.....	−	−
7 miles east.....	11	4	.....	−	−

Somewhat Polluted Waters.

½ mile east.....	900	155	.....	−	+
1 mile east.....	6,000	1,000	.....	+	+
2 miles east.....	370	49	.....	+	+
3 miles east.....	4,800	21	.....	−	+
4 miles east.....	240	70	.....	−	−
5 miles east.....	315	188	.....	−	−
6 miles east.....	2,700	120	.....	−	+
7 miles east.....	100	43	.....	−	−

CHEMICAL ANALYSES OF LAKE MICHIGAN WATER AT MANITOWOC, SHOWING WATERS OF DIFFERENT QUALITIES.

Source of Sample.	Turb.	Odor.	Color.	Free NH_3.	Alb. NH_3.	N'ates.	N'ites.	Cl.	Alk.	Oxy. Con.	T. S.
½ mile east....	4	S. veg.	0	0.000	0.024	0.02	0.001	3.6	107.	2.1	138.
1 mile east....	3	S. veg.	0	0.000	0.002	0.03	0.001	3.6	108.	2.0	136.
2 miles east...	0	S. veg.	0	0.004	0.024	0.03	0.000	3.8	108.	1.8	132.
3 miles east...	0	0	0	0.004	0.002	0.02	0.000	3.8	107.	1.9	134.
4 miles east...	0	0	0	0.000	0.064	0.02	0.000	3.4	107.	1.8	132.
5 miles east...	0	0	0	0.000	0.044	0.03	0.000	3.8	107.	1.9	126.
6 miles east...	0	0	0	0.012	0.016	0.02	0.000	3.3	108.	1.9	125.
7 miles east...	0	0	0	0.004	0.056	0.02	0.000	3.4	108.	1.9	125.
½ mile east....	0	Veg.	0	0.036	0.268	0.05	0.002	4.3	107.	3.5	146.
1 mile east....	0	Veg.	0	0.020	0.232	0.05	0.002	3.8	109.	3.1	146.
2 miles east...	0	Foul	0	0.108	0.232	0.03	0.002	3.8	105.	2.8	150.
3 miles east...	0	0	0	0.136	0.248	0.05	0.002	3.8	106.	3.3	153.
4 miles east...	4	0	0	0.050	0.330	0.05	0.004	3.8	109.	3.6	146.
5 miles east...	0	0	0	0.040	0.330	0.05	0.003	3.8	108.	3.3	140.
6 miles east...	0	S. veg.	0	0.020	0.240	0.05	0.005	3.0	110.	3.3	140.
7 miles east...	0	S. veg.	0	0.070	0.275	0.05	0.005	3.4	108.	3.2	138.

Summary and Conclusions.

As a result of these studies, we conclude that the water of Lake Michigan along the Wisconsin shore is not a uniformly safe source of supply. The water is polluted and at times quite heavily so, even out to a distance of seven miles from shore. The chemical and bacteriological data conclusively indicate that there are no permanent currents in this portion of the lake, and that sewage once deposited in it may be carried to various points depending on the direction and force of the wind. The prevailing currents can not be depended on to insure safety, owing to storms, and even winds of moderate force which continue for several days will modify these currents. Even in those instances where ledges of rock are supposed to form a barrier, safety is not insured.

We conclude that to insure a safe supply from the lake, the intake should be carried out twelve to fifteen miles from shore. Owing to the depth of the water, this is in many cases impractical, and involves great expense. There are only two other procedures left open. One is the purification of sewage, which would be only a partial remedy; and the other is the filtration of the water before carrying it into city mains. In any case, it seems that cities should cease the pollution of the lake by the dumping of their sewage into it. This does not entirely meet all the requirements in the case, owing to the enormous amount of shipping on the lakes. Thousands of passengers

on steamships are discharging their excreta daily during the larger part of the year into the water along the shore, especially in and about harbors. It seems probable that in spite of sewage purification, which should be undertaken in any event, that the demand for filtration will increase yearly, and that eventually all these cities will be obliged to furnish filtered water to their inhabitants. In the meantime, the use of hypochlorite of calcium has been recommended, and used in a number of instances with the most satisfactory results. This must always, however, be regarded as only a temporary expedient.

The Great Lakes must still be looked upon as a most useful and inexhaustible source of supply, but more care must be exercised in the future in preserving their purity, and in selecting the locations for water supply plants.

THE SIGNIFICANCE OF THE TIME AT WHICH GAS IS PRODUCED IN LACTOSE PEPTONE BILE.

WILLIAM W. BROWNE, PH.D.,
College of the City of New York.

During the summer of 1912, routine bacteriological examinations of the oysters of Narragansett Bay were made with the hope of determining the extent of the pollution of the oyster beds of Rhode Island by the sewage of cities and towns bordering on the bay. The examinations were conducted under the direction of Prof. F. P. Gorham of Brown University to whom the writer wishes to extend his thanks for the data here used. Throughout the entire series of experiments, the examinations of the oysters were made in general, according to the methods proposed in The Second Progress Report of the Committee on Standard Methods of Shell Fish Examination (December, 1911). In all cases, meat extract (3 grams to the liter) was used in the preparation of the media. Ease of preparation rendered its use invaluable in a work of this nature.

Lactose peptone bile was used as a presumptive test to indicate the presence of members of the Bacillus coli group and other lactose fermenters of intestinal origin. Inverted vials were used for the collection of the gas and the tubes were always incubated at 37° C. All inoculation into lactose peptone bile were made in duplicate and the gas was read and recorded at the end of 24-, 48- and 72-hour periods. In this paper are compiled the results obtained by comparing the number of tubes showing gas at the various periods.

During the period covered by this paper, 119 samples of oysters were examined. The beds from which these oysters were dredged varied greatly in character and position ranging from the highly polluted areas near the outlets of the sewers of the cities and towns through questionable areas which were sometimes coli-positive and again coli-negative to areas which were comparatively free from pollution near the ocean. During the examination of these 119 samples of oysters 3,570 tubes of lactose peptone bile were inoculated from which 1,929 produced gas distributed over the 24-, 48- and 72-hour periods as the following table will show:

TABLE I.

LACTOSE PEPTONE BILE TUBES SHOWING GAS.

Time in Hours	24	48	72
Number of Tubes Showing Gas	148	1361	420
Per cent	7.6	70.5	21.2

From the above table it can be seen that very few of the intestinal organisms, generally found in oysters, are able to produce gas in lactose

peptone bile by the end of the 24-hour period since out of 1,929 which showed gas only 148 or 7.6 per cent. produced gas at the end of that period. By the end of the 48th hour, however, 1,361 tubes or 70.5 per cent. produced gas showing that 48 hours represents the periods in which more than a majority of the intestinal organisms usually found in the oysters, produce their gas in lactose peptone bile. Gas was recorded at the end of the 72-hour period in 420 or 21.2 per cent. The gas produced by the end of the 72d hour probably represents the result of growth of attenuated forms and spore formers since we find more of this type of gas production in places which are distant from sources of pollution as will be explained in a later part of this paper.

An examination of the map of the State of Rhode Island reveals that Narragansett Bay is divided naturally into several well-defined areas by the presence of islands and peninsulas. The author has taken advantage of this fact and for the purposes of comparison, has divided that portion of the bay from which oysters for analysis were taken into eight distinct areas. Some of these areas include rivers which flow into the bay while others include large portions of the bay itself. Oysters were taken from the beds situated in almost every portion of these well-defined areas and at various intervals during the summer of 1912, so that any comparison that may be made between the various districts in the bay seem to the writer to be both reasonable and fair.

Plate I shows the divisions into which the author has divided the bay. A brief geographical description of each district will follow together with its likelihood of being polluted as might be judged both from bacteriological examinations and a superficial sanitary survey.

District I.

District I includes what is known as the Kickemuit River, a small shallow stream flowing into Mount Hope Bay from the north. Because of its shallowness and protection from winter storms, this river offers an ideal place for the cultivation of oysters. Extended bacteriological examinations have shown this river to be a variable locality. The examinations of one period showing the oysters to be of a high sanitary quality in so far as the presence of fecal organisms is concerned while only a few days later, examinations have revealed gross pollution. As there are no towns on its banks, this pollution must necessarily come from Mount Hope Bay. At the present time, it is thought that the wind and tide play a very important part in the varying conditions of this river.

District II.

This district includes Mount Hope Bay and extends from north to south from the state line to Bristol Ferry. The bay has two outlets one emptying into Narragansett Bay at Bristol Ferry while the other opens into the Sakonnet River. Bacteriological examinations reveal the oysters from Mount Hope Bay to be grossly polluted during the greater part of

the year. This condition might be expected since this bay receives the sewage of the City of Fall River and of the cities and towns along the Taunton River.

DISTRICT III.

District III is known as the Sakonnet River which is nothing more than an outlet for Mount Hope Bay. Being very wide, however, and near the ocean, its waters are greatly diluted and as a result, we find the water of the Sakonnet River to be in a relatively high state of purity bacteriologically.

DISTRICT IV.

District IV includes all the beds situated in Bristol Harbor and in the waters west of the Island of Rhode Island. Repeated bacteriological examinations have shown this region to be open to great pollution as it is the meeting place of the waters of Narragansett Bay, Bristol Harbor and Mount Hope Bay.

DISTRICT V.

District V includes the beds in the Warren River which for the greater part of the year are subject to gross pollution.

DISTRICT VI.

District VI may be designated as that region where the Providence River merges into Narragansett Bay. Bacteriological examinations show evidences of pollution.

DISTRICT VII.

This district known as Upper Narragansett Bay although open to more or less pollution from the Providence River seems to be almost able to care for about all the pollution which reaches it. Examinations have revealed pollution but not in quantity.

DISTRICT VIII.

District VIII includes that portion of the bay directly south of District VII and will be designated as Lower Narragansett Bay. Bacteriological examinations have failed to reveal evidences of much pollution.

In summary of the above description, the eight districts or areas may be roughly divided into three main classes as to their possibility of becoming polluted.

TABLE II.

CLASSIFICATION OF THE EIGHT DISTRICTS.

A. Open to Gross Pollution:	
Mount Hope Bay	District II.
Bristol Harbor	" IV.
Warren River	" V.
Providence River	" VI.
B. Variable Locality:	
Kickemuit River	District I.
C. Relatively Free from Pollution:	
Sakonnet River	District III.
Upper Narragansett Bay	" VII.
Lower Narragansett Bay	" VIII.

From the various beds which happened to be situated in the designated sections, oysters were taken to the laboratory and examined bacteriologically as outlined in the early part of the paper. In the following tables, are compiled the results obtained by recording the presence of gas in the lactose peptone bile tubes at the end of the 24-, 48- and 72-hour periods.

TABLE III.

NUMBER OF LACTOSE PEPTONE BILE TUBES SHOWING GAS FROM DISTRICT I.

KICKEMUIT RIVER.

Bed.	24 hours.	48 hours.	72 hours.
1	0	7	6
2	1	16	0
3	0	15	0
4	2	15	1
5	0	17	4
6	0	18	5
7	1	26	1
8	0	0	20
9	0	9	15
10	0	2	11
11	2	17	4
12	0	28	0
13	0	25	2
14	0	18	2
	6	213	71
Per cent.	2.0	73.4	24.4

TABLE IV

NUMBER OF LACTOSE PEPTONE BILE TUBES SHOWING GAS FROM DISTRICT II.

MOUNT HOPE BAY.

Bed.	24 hours.	48 hours.	72 hours.
1	4	10	2
2	1	21	1
3	0	10	0
4	0	10	2
5	1	6	1
6	1	6	0
7	9	6	0
8	1	10	2
9	0	16	1
10	6	6	0
11	0	12	1
12	12	3	1
13	3	18	1
14	5	24	0
15	0	3	3
	43	161	15
Per cent.	19.6	73.4	6.8

TABLE V.

NUMBER OF LACTOSE PEPTONE BILE TUBES SHOWING GAS FROM DISTRICT III.

SAKONNET RIVER.

Bed.	24 hours.	48 hours.	72 hours.
1	0	0	1
2	0	2	4
3	0	1	5
4	0	1	5
5	1	3	4
6	0	3	3
7	0	1	4
8	0	9	4
9	0	13	2
	1	33	32
Per cent.	1.5	50.0	48.4

TABLE VI.

NUMBER OF LACTOSE PEPTONE BILE TUBES SHOWING GAS FROM DISTRICT IV.

BRISTOL HARBOR.

Bed.	24 hours.	48 hours.	72 hours.
1	0	9	0
2	0	19	0
3	13	15	2
4	0	14	1
5	13	8	4
6	0	16	0
7	0	20	0
8	0	19	2
9	0	4	3
10	0	9	0
11	0	9	6
12	0	10	8
13	0	6	4
14	0	4	4
15	2	7	4
16	2	3	1
17	2	21	0
18	0	4	1
19	3	5	8
20	1	22	3
21	0	28	0
22	0	30	0
23	0	30	0
24	0	30	0
25	0	0	15
26	0	13	2
27	0	4	2
	36	349	70
Per cent.	7.9	76.7	15.3

A careful study of Plate II brings out some very interesting points concerning the production of gas in lactose peptone bile. As stated earlier in this paper, a very small percentage of the tubes show gas by the end of 24 hours. We would naturally expect those districts which are open

TABLE VII.

NUMBER OF LACTOSE PEPTONE BILE TUBES SHOWING GAS FROM DISTRICT V.

WARREN RIVER.

Bed.	24 hours.	48 hours.	72 hours.
1	0	26	0
2	1	17	2
3	13	11	3
4	5	10	0
5	0	11	3
6	0	25	1
7	0	18	2
8	0	23	0
9	0	11	3
	19	152	14
Per cent.	10.2	82.1	7.5

TABLE VIII.

NUMBER OF LACTOSE PEPTONE BILE TUBES SHOWING GAS FROM DISTRICT VI.

PROVIDENCE RIVER.

Bed.	24 hours.	48 hours.	72 hours.
1	2	26	0
2	2	12	5
3	1	13	4
4	0	19	2
5	2	17	1
6	1	8	4
7	8	21	1
8	0	13	7
9	0	17	1
10	0	10	4
11	0	13	2
12	0	5	3
13	0	21	0
14	0	30	0
	16	225	34
Per cent.	5.8	81.8	12.3

to gross pollution producing a larger percentage of tubes in 24 hours than those tubes inoculated with material from regions which are comparatively free from pollution. And such is the case. The arrangement of the districts beginning with the areas which show the largest percentage of tubes in 24 hours is as follows:

1. Mount Hope Bay . . . . . 19.6 per cent.
2. Lower Narragansett Bay 11.4

TABLE IX.

NUMBER OF LACTOSE PEPTONE BILE TUBES SHOWING GAS FROM DISTRICT VII.

UPPER NARRAGANSETT BAY.

Bed.	24 hours.	48 hours.	72 hours.
1	0	19	1
2	0	16	1
3	0	10	6
4	1	7	3
5	0	18	8
6	1	27	0
7	0	6	8
8	0	10	7
9	0	4	6
10	0	8	12
11	0	4	0
12	3	7	2
13	1	11	2
14	0	3	17
15	0	2	11
16	0	11	2
	6	163	86
Per cent.	2.3	63.9	33.7

TABLE X.

NUMBER OF LACTOSE PEPTONE BILE TUBES SHOWING GAS FROM DISTRICT VIII.

LOWER NARRAGANSETT BAY.

Bed.	24 hours.	48 hours.	72 hours.
1	1	15	12
2	3	12	1
3	0	5	6
4	0	5	5
5	4	5	0
6	0	5	2
7	10	1	0
8	0	9	17
9	0	4	5
10	0	0	10
11	0	4	12
12	0	0	7
13	1	1	6
14	0	0	5
15	2	0	9
	21	66	97
Per cent.	11.4	35.8	52.7

3. Warren River . . . . . 10.2 per cent.
4. Bristol Harbor 7.9

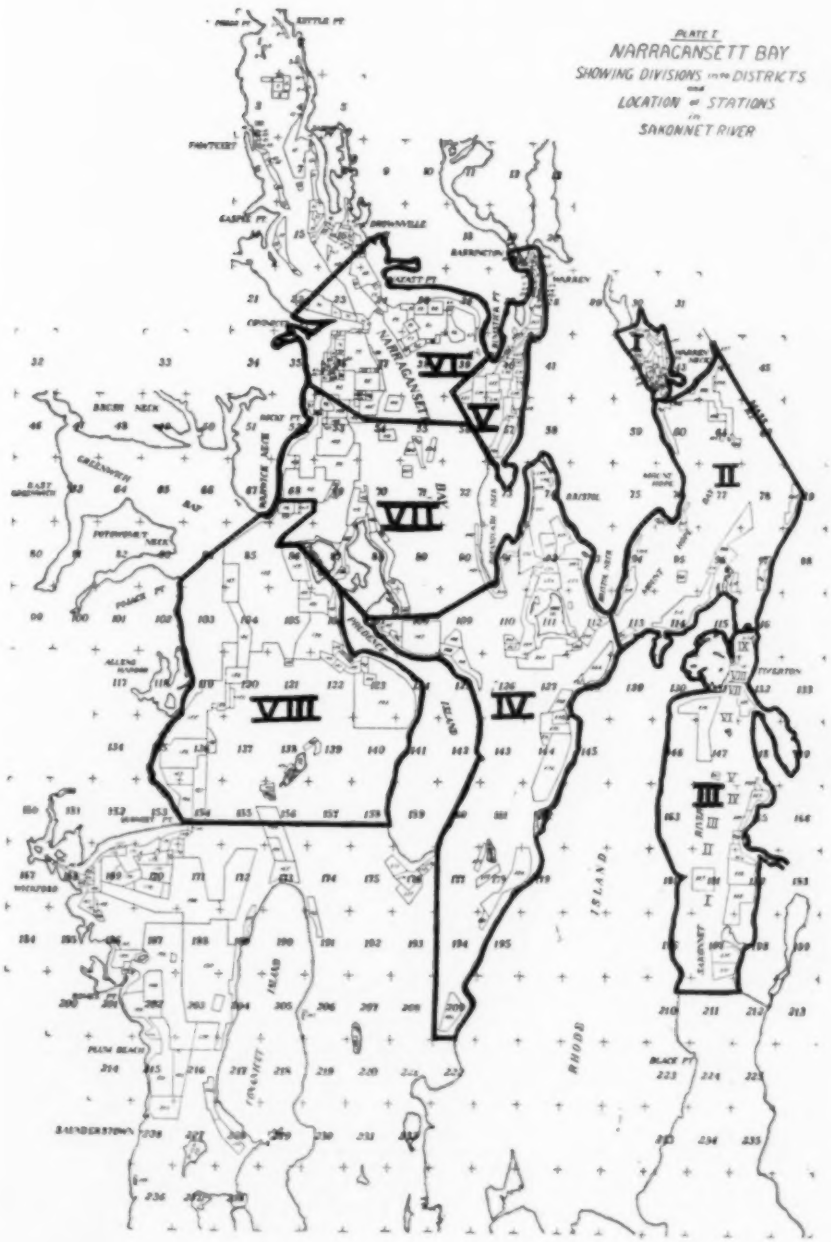
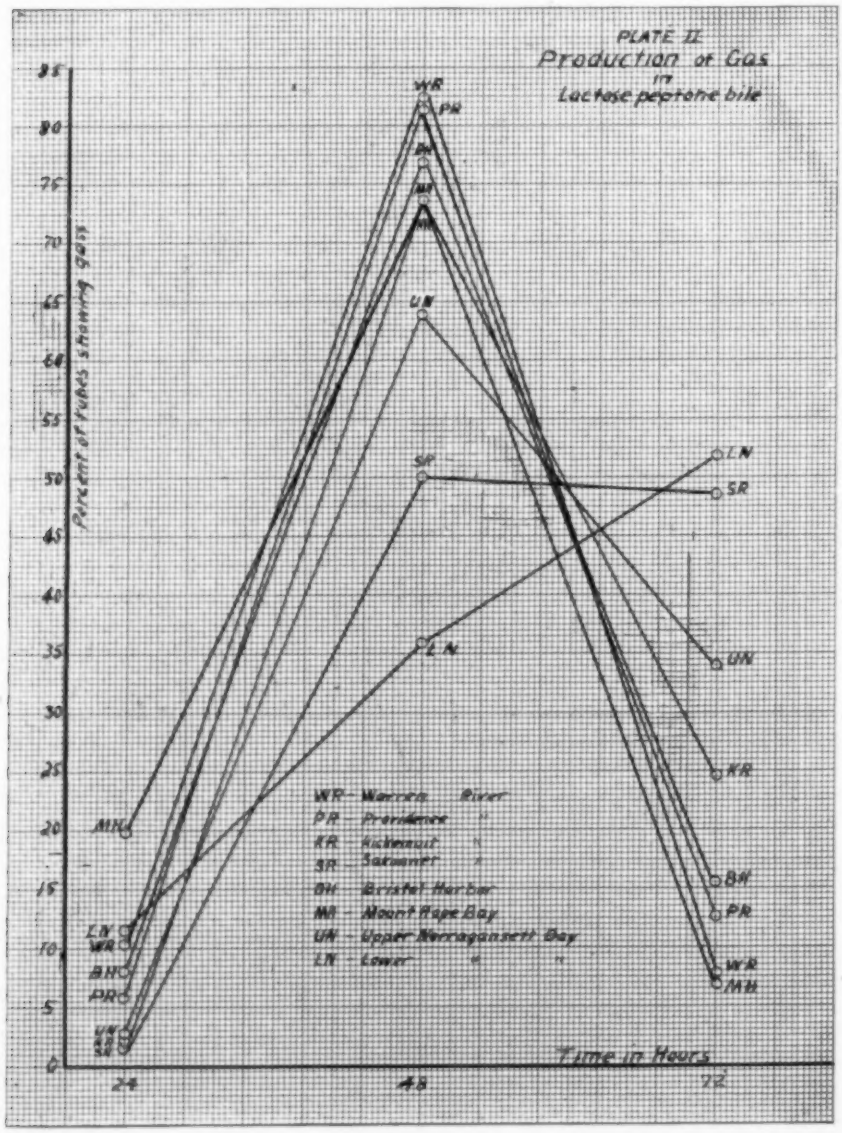


PLATE I.
NARRAGANSETT BAY
SHOWING DIVISIONS into DISTRICTS
and
LOCATION of STATIONS
in
SAKONNET RIVER
I
II
III
IV
V
VI
VII
VIII
NARRAGANSETT BAY
RHODE ISLAND
SAKONNET

5. Providence River ..... 5.8 per cent.
6. Upper Narragansett Bay 2.3
7. Kickemuit River 2.0



8. Sakonnet River ..... 1.5 per cent.

From this list it can be seen that districts like Mount Hope Bay, Bristol Harbor, Warren River and Providence River which are open to pollution

roughly group themselves at the top of the list while districts which are distant from sources of pollution like the Sakonnet River, Kickemuit River and Upper Narragansett are found at the bottom of the list. The district designated as Lower Narragansett Bay has cast its lot with the polluted areas as a result of a polluted sample from bed seven.

This division is still more apparent at the end of the 48th hour. The arrangement of the districts beginning with the districts having the largest percentage showing gas at the end of 48 hours is as follows:

1. Warren River.....82.1 per cent.
2. Providence River.....81.8
3. Bristol Harbor.....76.7
4. Mount Hope Bay.....73.4
5. Kickemuit River.....73.4
6. Upper Narragansett Bay.....63.9
7. Sakonnet River.....50.0
8. Lower Narragansett Bay.....35.8

Here we find those grossly polluted areas showing a larger percentage of gas tubes than those districts which are comparatively free from pollution. For instance, the percentage of tubes showing gas from the Warren River is over twice that percentage shown by the gas tubes from Lower Narragansett Bay which now has taken its rightful position among the less polluted areas. The Kickemuit River which has by extended bacteriological examinations been proved to be a very changeable district, occupies a position in the center of the list as we should expect.

At the end of the 72d hour the arrangement of the districts in the order of percentages of tubes showing gas is quite reversed as the the following list will show:

1. Lower Narragansett Bay.....52.7 per cent.
2. Sakonnet River.....48.4
3. Upper Narragansett Bay.....33.7
4. Kickemuit River.....24.4
5. Bristol Harbor.....15.3
6. Providence River.....12.3
7. Warren River..... 7.5
8. Mount Hope Bay..... 6.8

Those regions which are comparatively free from pollution produce much larger percentage than regions which are open to pollution. At the end of the 48-hour period, the percentages of tubes showing gas from the Warren River was over twice as large as that percentage from the Lower Narragansett Bay for the same period. At the end of the 72d hour, the positions are reversed and the percentage of showing gas from the Lower Narragansett Bay is over seven times as large. The same comparison may be made between the other districts with the same result. The Kickemuit

holds the same general position in the center of the list. Generally speaking those districts which were at the top of the list for the 24- and 48-hour periods are found at the bottom at the end of the 72d hour.

The only explanation of these results seems to the author to be that those districts which lie near the source of pollution must necessarily be exposed to vast numbers of healthy vigorous intestinal organisms which only recently have left their native haunts and when these organisms are placed in a suitable culture medium, like lactose peptone bile, a rapid growth with the production of gas must result. Hence, we find that the intestinal organisms isolated from oysters taken from polluted regions produce the greater part of their gas by the end of the 48th hour.

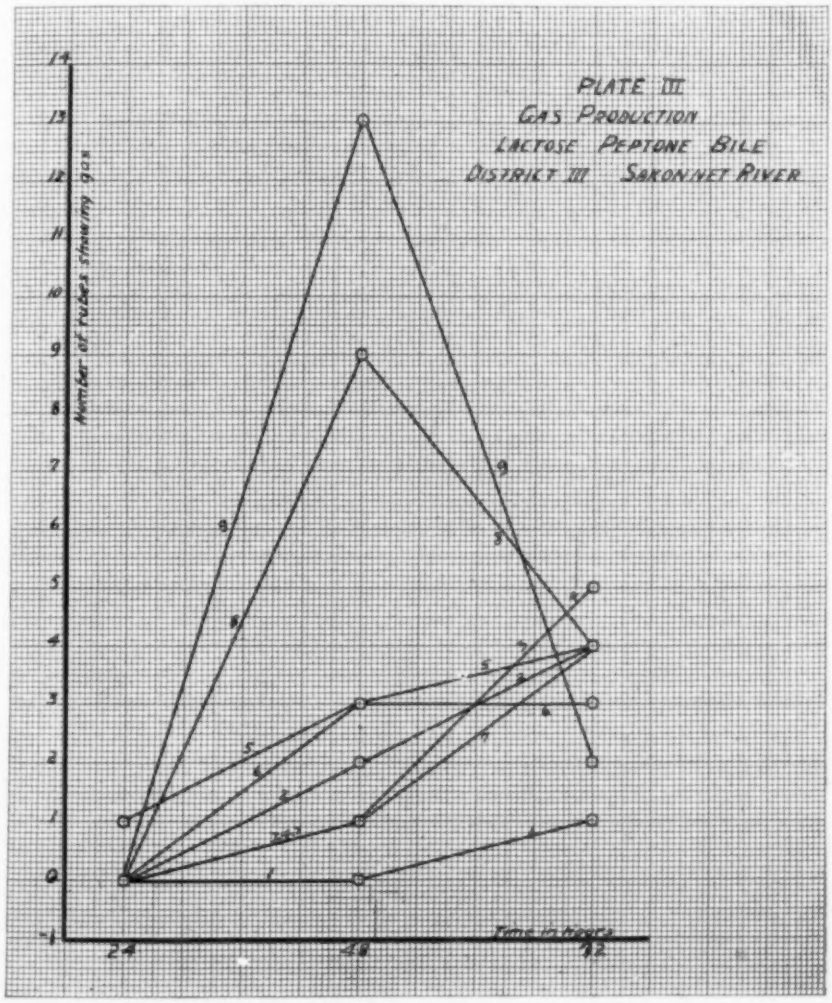
The beds which are situated in districts more remote from the sources of pollution present a different condition. The intestinal organisms which finally reach these beds, must certainly be in an attenuated condition and greatly reduced in numbers due to their long journey through the salt waters of the bay. Hence the growth of the organisms and with that, of course, the production of gas is retarded. The comparison between those districts near the source of pollution which produce the greater part of their gas by the 48th hour and those districts distant from the sources of pollution which produce the greater part of their gas after the 48th hour, may be seen in the following table:

District.	Gas produced at 48 hours in per cent.	Gas produced at 72 hours in per cent.
Mount Hope Bay	93.0	6.8
Warren River	92.3	7.5
Providence River	86.8	12.3
Bristol Harbor	84.6	15.3
Kickemuit River	75.4	24.4
Upper Narra. Bay	66.2	33.7
Sakonnet River	51.5	48.4
Lower Narra. Bay	47.2	52.7

From the above table it may be seen that the percentage of tubes showing gas by the end of the 48th hour decreases as we proceed from those districts open to gross pollution towards the districts which are free from pollution. At the end of the 72d hour things are just opposite. The percentage of tubes which show gas increase as we proceed from the greatly polluted towards the less polluted areas. With the exception of the Lower Narragansett Bay District over 50 per cent. of the tubes show their gas by the end of the 48th hour.

This same conditon was found to be true for the Sakonnet River which is really an outlet for the waters of Mount Hope Bay from which it receives the greater portion of its pollution. The town of Tiverton also con-

tributes a small part. During the summer nine samples of oysters were taken from different portions of the river ranging from the point of greatest pollution near Mount Hope Bay to those beds situated near the ocean. Those beds which were near Mount Hope Bay produced the greater part of their gas by the end of the 48th hour while those nearer the ocean showed



the greatest number at the end of the 72d hour. Plate III, Curve 1, represents the gas produced from oysters taken from beds nearest the ocean and so on up to Curve 9 which represents the gas produced by oysters taken from beds nearest the sources of pollution. The other districts of

the bay, on account of the complicated sources of their pollution, would not lend themselves to this treatment.

From the data gathered together in this paper, one cannot help but be impressed by the strict division obtainable by recording the number of tubes of lactose peptone bile showing gas at the end of the 24-, 48- and 72-hour periods. Those tubes inoculated from oysters taken from highly polluted areas produce almost all their gas by the end of the 48th hour while those tubes inoculated from oysters taken from regions more distant from the source of pollution produce a greater amount at the 72d hour. The writer is of the opinion that this method might be used as a supplement to the regular oyster analysis in the determination of whether the contamination is recent or remote by considering the temporal conditions of gas production in lactose peptone bile.

Summary.

1. Lactose peptone bile tubes inoculated with the shell liquor of oysters taken from 119 different beds of Narragansett Bay produce the greater part of their gas by the end of the 48th hour.

2. Tubes of lactose peptone bile inoculated with the shell liquor of oysters taken from polluted districts produce almost all their gas by the end of the 48th hour.

3. Tubes of lactose peptone bile inoculated with the shell liquor of oysters taken from regions which are comparatively free from pollution produce a larger part of their gas by the end of the 72d hour.

4. Consideration of this temporal factor in the production of gas in lactose peptone bile might aid in the determination of whether the contamination of oysters is recent or remote.

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

The quarterly meetings of the Massachusetts Association of Boards of Health was held at Gallup's Island, Boston Harbor, Thursday, July 31, under the presidency of Dr. Samuel H. Durgin.

On motion, the reading of the minutes of the April meeting was dispensed with.

Upon the recommendation of the Executive Committee the following members and officers of boards of health were elected to membership in the Association: Edith Beckler, bacteriologist, Wellesley Board of Health; T. F. Harris, inspector, Wellesley Board of Health; Dr. George Osgood, and Dr. W. F. Snow, Cohasset Board of Health.

The Executive Committee recommended the appointment of a committee of five by the President to prepare a revision of the by-laws and constitution for the purpose of increasing the efficiency of the Association, and to report at the next meeting.

It was moved and seconded that the recommendation of the Executive Committee be adopted. The motion was carried.

It was moved and seconded that the committee be requested to report in writing to the members of the Association, previous to the next meeting. The motion was carried.

Doctor Kennedy, in behalf of the New Bedford Board of Health, extended an invitation to the Association to hold its next meeting in New Bedford in October. The invitation was seconded and adopted.

REPORT OF LEGISLATIVE COMMITTEE.

In addition to legislation reported upon at the last meeting the following matters are of interest to local boards of health:

The attempts at reorganization of the State Board of Health were defeated.

All proposed milk legislation was defeated with the exception of one measure which penalizes the use of unclean utensils in handling and treatment of milk.

A new statute, chapter 743, provides that ice cream must contain at least 7 per cent. of milk fat. While this is but one-half of the Federal standard it is better than none. The enforcement of this act rests with inspectors of milk.

GEORGE E. BOLLING,
Chairman.

PAPERS PRESENTED.

The following papers were then read:

Organization, Powers and Duties of the United States Public Health Service Today, by Dr. John F. Anderson, director of the Hygienic Laboratory of the United States Public Health Service, Washington, D. C.

A Recent Contribution by the Federal Government to Preventive Medicine, by Dr. Arthur Reed Perry, Washington, D. C.

An Experiment in Public Health Administration in Massachusetts, by Prof. Earle B. Phelps, Massachusetts Institute of Technology, Boston, Mass.

(These three papers with discussion are printed elsewhere in this issue of the JOURNAL.)

The following resolution was presented by Dr. H. Lincoln Chase:

Resolved, That the Massachusetts Association of Boards of Health extends congratulations to the United States Department of Labor upon the interesting and valuable report it has recently made on the Causes of Death Among Woman and Child Operatives in Cotton Factories, and urges further application of the same methods therein exemplified to inquiry in to causes and death in cities typical of industries other than that already so carefully investigated by the United States Department of Labor.

The resolution was seconded and adopted.

There being no further business the meeting then adjourned.

NOTICE TO M. A. B. H. MEMBERS.

WANTED: Copies of the JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH from 1891 t0 1903, inclusive. Any one having copies of which they wish to dispose or knowing of any one who may have such copies please communicate with

FRANCIS GEO. CURTIS,
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399 Hammond St., Chestnut Hill, Mass.

BOOK REVIEWS

Preventative Medicine and Hygiene. *By M. J. Rosenau. With Chapters on Sewage and Garbage by G. C. Whipple, on Vital Statistics by C. L. Wilbur and on the Prevention of Mental Diseases by T. W. Salmon. D. Appleton and Co., New York, 1913. $6.00.*

Medical Schools have long desired, and still desire, to have the whole subject of Public Health treated in minute detail in a single book, however large that book may be. The reviewer believes that the interests of sanitary science would perhaps be better served by giving the ordinary medical practitioner a much more broad and general treatment of fundamentals, sufficient for intelligent coöperation with public health authorities, leaving details to be considered, by those specializing in public health, in separate treatise of a really exhaustive nature. The demand for text-books covering the whole field in its minutiæ exists, however, and must be met. It is a termendous, an almost impossible task. The Germans meet it by Hygienes in ten volumes which are really libraries by different experts. English and American authors struggle with it, single-handed, usually unsuccessfully. Doctor Rosenau has followed the German custom to the extent of getting three recognized experts to write chapters on Sewage and Garbage and Vital Statistics and Mental Diseases. For the rest, his own unusually wide experience qualifies him perhaps better than any other American sanitarian for such a task and he has produced a sound and well-proportioned and scholarly work, quite admirable for its type, and almost, if not quite, justifying the type.

The reviewer must demur a little at the title of the book. The use of the term "hygiene" for the personal conduct of life, food, exercise, sleep and the like, and of "sanitation" for the control of the environment, water supply, air supply, food adulteration, waste disposal, etc., has been pretty generally accepted in this country. With hygiene in this sense, Doctor Rosenau does not deal and to sanitation he devotes about half the book. "Preventive Medicine" may well be used to denote the control of specific communicable disease, by isolation and preventive inoculations and "Preventive Medicine and Sanitation" would be a more accurate title for this work.

The first section of the book deals with the prevention of the communicable diseases and takes up each disease in turn, classifying them according to their portals of entry, an excellent plan, quite novel in a work of this type. The book begins rather abruptly, plunging directly into a discussion of smallpox. A brief introductory chpater on the sources and vehicles of infection in general (such as one finds tucked away in the first half of Chapter VI) would surely be helpful to the student. Smallpox, rabies, the venereal diseases and tetanus are considered first, as diseases having specific or special prophylactic measures. Under smallpox the reviewe notes with some surprise the statement that the virus may live for a considerable time on fomites and that toys, pencils, books, etc., may carry the infection. Venereal diseases are admirably treated as "the most pressing problem of preventive medicine that confronts us at the present day." Typhoid fever, cholera, dysentery and hookworm disease (spread largely through the alimentary discharges) and tuberculosis, diphtheria, measles, scarlet fever, whooping cough, mumps, lobar pneumonia, influenza, common colds, and cerebrospinal fever (diseases spread largely through discharges from the nose and throat) are discussed in the light of the most modern knowledge and with excellent judgment. In connection with typhoid a chronic carrier is defined as one who discharges bacilli for over six weeks, only half the time set by some of the best German authorities. It is good to see a brief chapter on the common colds which, as the author says, would be promoted "from the trivial into the rank of the serious diseases" if we could trace out the "sum

total of suffering, inconvenience, sequelæ and economic loss" resulting from them. The chapter on Insect-borne Diseases is admirable, particularly in relation to plague preventive measures. There is a misprint in the table on page 187 of "typhoid fever" where "typhus" is meant. Miscellaneous diseases include infantile paralysis, chickenpox, glanders, anthrax, foot-and-mouth diseases, malta fever, leprosy and mental diseases (treated by Dr. T. W. Salmon). Doctor Rosenau's fairness and conservatism in dealing with the mooted questions of the etiology of poliomyelitis (in the solution of which he has been so actively concerned) are particu larly noteworthy.

Section II deals with Immunity, Heredity, and Eugenics. The discussion of immunity is excellently done but it seems somewhat doubtful whether the laws of Mendelian heredity and the methods of Biometry should be included in a book, already so loaded with a vast diversity of subjects, as a text-book of public health must necessarily be.

Section III on Foods again is admirable. In no other place so far as the reviewer is aware is there a treatment of this general subject which approaches Doctor Rosenau's in sanity and balance. The Pure Food Law is analyzed and explained, wtih examples of the various types of adulteration. Decomposition is discussed very clearly and the difference between technical and objectionable decomposition pointed out. Food preservation is next taken up and the dubious and conflicting evidence as to the harmfulness of the common preservatives summarized. The chapter on Milk is particularly good, as would be expected of the author on "The Milk Question of." Chapters on Animal and Plant Foods follow. In the latter pellagra is included for, in the opinion of the author, "the bulk of evidence indicates that it is caused by spoiled corn."

The fourth section of the book deals with Air and here again the modern developments of sanitary science for the first time find place in a text-book. One looks with interest to see if Doctor Rosenau has formulated any standards for minimum room temperature or for humidity and finds that he has wisely refrained from doing so. These are problems which must be settled by future experimentation. As a method of measuring illumination he gives only the exposure of sensitized paper, which is probably inferior to the photometer for measuring the qualities of light which affect the eye. In connection with Doctor Rosenau's discussion of his own results on the detection of specific proteid matter in air by the anaphylactic reaction it may be noted that two recent independent investigations carried on at the College of Physicians and Surgeons, New York, and at the College of the City of New York have failed to confirm the Harvard results. The reviewer is inclined to question the statement that "it is very probable that a decrease in mental and physical efficiency would result from a prolonged exposure to a vitiated atmosphere, even though it were kept dry and cool." Have we really scientific evidence to make it as yet even "probable" that a "vitiated" atmosphere has any effect at all when thermal conditions are properly controlled? These are all, however, minor criticisms on a chapter which is on the whole excellent. It is followed by a chapter on the Mechanics of Ventilation which is rather brief but perhaps sufficient for the medical student.

The sixth section of the book deals with soil and again the bogeys of the older sanitation are disposed of in a very satisfactory manner.

The next section on Water includes a full summary of the analytical procedure recommended by the Committee on Standard Methods of the American Public Health Association. Doctor Rosenau insists on the importance of the complete isolation of the colon bacillus which is not in accord with a growing practice among water bacteriologists. The view that all members of the group of organisms which form gas in lactose media are equally significant of pollution is pretty generally accepted today. In the chapter on Water Filtration is the most serious error in the book, the statement repeated in various froms that mechanical filtration is "still in the experimental stage." The reviewer is accustomed to tell his classes, as a bit of history, that this view was taught when he

was a student. Today, however, the efficiency of mechanical filters has been amply demonstrated by bacteriological and epidemiological evidence at scores of plants. Doctor Rosenau apparently accepts the Mills-Reincke phenomenon, the decrease in the general death rate, outside of the intestinal diseases, by water filtration, without reserve. The additional data which he gives on page 806 in support of the Mills-Reincke theorem do not lend much weight to it. Of the eight cities cited three show a reduction in total death-rate quantitatively less than the reduction in typhoid death-rate and the city which shows the greatest reduction in total death-rate shows only an infinitesimal decrease in typhoid.

Professor Whipple's sections on Sewage and Refuse Disposal are exceedingly brief (27 pages and 4 pages respectively). They are, of course, souud and well proportioned and, like the chapter on Ventilation, perhaps give as much as can be expected in a medical school. They are necessarily insufficient for the specialist in public health.

Doctor Wilbur's section on Vital Statistics contains an excellent discussion of registration laws and their enforcement, and a good treatment of the fundamental data of population. One misses, however, an analysis of special rates and ratios such as are used in dealing with infant mortality and industrial tuberculosis and, particularly a discussion of statistical fallacies, to which the medical man and the sanitarian are often so unfortunately prone.

Sections X and XI deal with Industrial Hygiene and School Hygiene and are excellently handled. In the former the danger of ingesting lead compounds from fingers, and in other ways than through the air, is perhaps, underestimated and the problems of the dusty trades might receive a somewhat fuller treatment.

The last section deals with Disinfection and is largely a condensation of the author's book on Disinfection and Disinfectants.

Sanitary science has developed tremendously in many different lines during the last five years. Doctor Rosenau has presented in this book the latest and best opinion in the various fields of public health work and has knit the whole together into a clear and sane and well-balanced work. It should take its place at once as the standard text-book on public health for medical schools and it will prove an invaluable work of reference for the practical sanitarian.

C. -E. A. Winslow.

The New Public Health. *By Hibbert Winslow Hill, M. B., M. D., D. P. H., Director, Institute of Public Health, London, Ontario; Late Director, Division of Epidemiology, Minnesota State Board of Health. First published as a series of eleven monthly articles by the Journal-Lancet of Minneapolis, under the auspices of the Minnesota State Board of Health. 12 mo., 128 pages, Minneapolis, Minn.: Press of the Journal-Lancet, 1913.* 50¢.

The title of Doctor Hill's little book is perhaps somewhat misleading. The book is not, as might be imagined, a discourse on the various opportunities and duties of public health authorities, or a description of the detailed procedures to be employed in this field of work; it is, however, an able exposition of the latest scientific ideas concerning the control of the communicable diseases.

In essence, Doctor Hill teaches that the sources of the infectious diseases are no longer to be looked for in the condition of our general physical environment (as in the old public health), but in the *discharges from infectious persons.* These discharges now become the strategic point of attack, and the problem of health authorities becomes the location of infectious persons (including carriers and missed cases) and their supervision so their discharges do not reach new victims. The old ideas of the relation of filth to disease receive scant courtesy, and small emphasis is allowed measures affecting the individual's resistance as compared with those shielding him from infection. Five great routes of infection are noted—flies, food, milk, water, and contact—but while

the author believes in the desirability of guarding these, he reiterates that the more fundamental effort is the supervision of infectious persons.

Among the valuable discussions in the book is that of the old and new epidemiological methods, a matter on which the author is by experience especially qualified to speak. The importance and practicability of locating missed cases and carriers is dwelt upon, this work being the function of "concurrent" epidemiology—that of contact outbreaks, and "the most powerful and practical weapon yet devised for *the abolition of the infectious diseases.*" In this operation unknown cases are located by searching the "zones of infection" indicated by known cases. As this search "is a problem not only solvable, but already solved, and already reduced to a routine basis," one cannot but wish that Doctor Hill had given a somewhat more extended exposition of the scope and nature of the "zones of infection."

Other illuminating discussions are devoted to contact infection, the public health engineer, the public health laboratory, and the public health statistician. Interesting chapters are also given over to the possibilities of individaul defense against infection, to the principles of community defence, and to the application of these principles as exemplified by tuberculosis. The author's position regarding health education in the broader sense will be received with some question, as he maintains that this is not a matter for health authorities, but for the professional teachers—in particular in the lower grades of the public school system. But Doctor Hill admits that such education will be at best of partial effectiveness, and one is unconvinced that the health department has not, or will not have, an important function in systematic, well-considered publicity.

In conclusion Doctor Hill points out that the new public health principles are now established, and questions why they are not yet more generally applied. In answer he states that it is chiefly because the general public still clings to theories that were beginning to be discarded in scientific circles twenty years ago. Two chief fallacies are mentioned—that infectious diseases come from "general bad surroundings," and that "general good health" protects against infection. These points of view are here vigorously combated. Applying the new principles Doctor Hill is confident of the result. "To do this properly means intimate attention and supervision of infectious persons by men who know their business and do nothing else. If one such man to every 20,000 persons began, tomorrow, everywhere, his work, infectious diseases in ten years would have vanished and would have become mere history."

Among pertinent passages which indicate the tone of the book are the following: "It is the ability to find the *private sources* of infection in *contact* outbreaks that makes epidemiology the pivotal factor of modern public health." (page 48); "Modern public health practice for the control of infectious diseases consists, not in the *physical surveillance* of whole communities, but in the *sociological study* of the *infected persons* in them." (page 48); "Some day the equally logical step should follow,—the holding of the community responsible [legally] for *all* infectious diseases, by *whatever* routes they travel, including contact." (page 73); "Much-abused, laughed at, neglected, he [the vital statistician] is, or will be, guide, map-maker, intelligence-department, all in one; he is, or will be, like the cost-of-production scientific manager of modern business, 'the most indispensable man on the staff.'" (page 93); "*No person energetic enough to advocate the abolition of the fly should hesitate a moment to advocate the far simpler, smaller, easier, and far more important work of abolishing those germs that alone can make the fly a danger.*" (page 116).

This book is written in lively style by a man who is alive to the theory of his subject and its possibilities for the future. It may be recommended to the public health official as suggestive and stimulating, and to the layman or social worker as distinctly informing.

Franz Schneider, Jr.

HEALTH DEPARTMENT REPORTS AND NOTES.

TO STATE AND MUNICIPAL HEALTH OFFICERS.

This new division of the Journal is specially designed to be of use to active Health Officers of the countries represented in the American Public Health Association. It will be unable to serve its true function unless the Health Officers are willing to coöperate by sending to the Journal copies of their reports, bulletins, new ordinances and personal information which will be of general interest. Furthermore it would be distinctly desirable if communications on subjects of general interest are submitted for publication in this division of the Journal. The management will further welcome any suggestions from Health Officers for the improvement of this division. All communications should be addressed to Selskar M. Gunn, Managing Editor, American Journal of Public Health, 755 Boylston St., Boston, Mass.

REPORTS.

Cincinnati, Ohio.

Dr. J. H. Landis, health officer of Cincinnati, Ohio, presents an excellent report of the work of the Department of Health for the year 1912. It is logically arranged and the facts are so concisely stated as to give the impression that so much has been done that it must be reported briefly if at all. The only exception lies in the fact that Dr. Landis' report covers some of the same ground as those of his subordinates but it is short and serves as a recapitulation or summary of the rest of the book.

Cincinnati has a population of 394,650 and spends less than twenty-two cents per capita on the Department of Health. It has a birth rate of 19.93 despite an adverse decision of the Ohio Supreme Court concerning the reporting of births. The death rate for 1912 is 16.34 per thousand which is the lowest since 1909. Among the chief causes of death are tuberculosis, pneumonia and organic diseases of the heart. The high tuberculosis death rate is said to be explained in part by the fact that many patients are attracted from outside the city by the prospect of free treatment at the tuberculosis hospital.

Among the steps toward increased efficiency in the Department is the diversion of $16,500 formerly used to pay an assistant school inspector and twenty-five part-time district physicians to the hiring of eleven district physicians on full time. It is estimated that this plan has brought about a 30 per cent. increase in efficiency. Another improvement initiated by the Division of Medical Inspection and Relief is the opening of low-temperature rooms and open-air schools for anemic and tuberculosis children. School nurses have proved to be such a success in supplementing the work of the school physician and in forming a connecting link between the school and the home as to warrant the employment of additional nurses for 1913. The average daily attendance at the six Infant Welfare Stations where milk is supplied shows an increase from 120 in 1911 to 228 in 1912.

The Division of Food Inspection has been able to reach the utopian state of affairs where

the associations of meat-packers and dairymen have become its strongest backers in the crusade for pure food and complete and rigid inspection is carried on with the result that $241,519.61 worth of food was condemned in the past year. Among the dairies conditions have been improved by the increased number of inspections made possible by the use of a motorcycle. The score-card system of inspection is used and its educational value is supplemented by stereopticon lectures to dairymen and consumers on the proper handling of milk. A rather original plan is the so-called Kitchen Inspection which includes all hotels, oyster houses, lunch counters, public institutions, etc. A system of grading had been worked out and lists of the standing of the 550 kitchens in the city are published in the monthly health reports.

The Sanitary Division has brought about marked improvements in the sanitary conditions of barber shops and bake-shops by systematic and constant inspection, one policeman devoting his entire time to each class. Seventy arrests and prosecutions were made for expectorating on street cars and sidewalks; 6,524 letters and notices were sent out resulting in 6,008 nuisance abatements.

Although the work of the Laboratory Division was handicapped by crowded quarters and the plans for a new location, the number of samples examined during the year was 15,692. Agglutination reactions with B. paratyphosus and B. enteritidis have been introduced and reports on diphtheria swabs received before 2 P. M. are given out the same day the specimen is received. It has been found that milk samples taken on Sunday fall below standard much more frequently than through the week and it is supposed that the dealers are taking advantage of the day of rest on the part of the inspectors to add to their profits. This contains a valuable hint to other departments of health. In arrests made for adulteration of foods it has been found advisable to place a large proportion of the cases of the open docket or to suspend the fine on condition that the money be expended on certain improvements within a definite time limit. Under the auspices of the laboratory fifteen lectures, most of them illustrated with stereopticon views, have been delivered before various mothers' clubs, teachers' leagues, and public school children.

The whole report indicates activity and enthusiasm, combined with intelligent and up-to-date methods in every department of the work.

Richmond, Va.

Dr. Ernest C. Levy presents his seventh report as chief health officer and it is evident that it is a worthy successor to his preceding reports. The crude death rate of the city for 1912 was 20.78 and 18.56 if the non-residents are excluded. The death rate from preventable diseases was phenomenally low and gives direct evidence that the public health work done in this city is of the highest grade. The death rate from typhoid fever, malarial fever, measles, scarlet fever, whooping cough, diphtheria, dysentery, influenza, tuberculosis (in all its forms), and infantile diarrhea was 410 per 100,000, a decrease of 187 since 1907. It is interesting to note, on the other hand, that the death rate from cancer, apoplexy, heart disease, Brights disease, congential debility, suicide, legal electrocution, and other violence was 900 per 100,000 in 1912, an increase of 188 since 1907. The death rate from typhoid fever showed a decrease over that of 1911 being 16.8 per 100,000.

Doctor Levy gives his customary critical study of the typhoid fever deaths. A very great decline in the reported death rate from malaria is noted and it is pointed out that this is due to the fact that the diagnosis of malaria in the past has not been a true diagnosis and that probably most of the deaths formerly attributed to malaria were really due to tuberculosis. In connection with the prevention of diphtheria Doctor Levy reports on the special work of the medical inspector, Dr. C. C. Hudson, who on his routine visits to report cases of diphtheria examines all other children in the house and wherever a sore nose is found a swab is

taken. In this way Doctor Hudson has detected nearly twenty cases of chronic nasal diphtheria, none of which had been previously recognized.

With regard to scarlet fever, Doctor Levy emphasizes the point that this disease is more dreaded by the public, and, indeed, by most physicians, than is measles. As a matter of fact in Richmond there have been but forty-one deaths from scarlet fever in the past twenty-six years while measles has been responsible for 196 deaths during the same period.

An attempt was made to fight measles by the closing of schoolrooms in which the measles had appeared for a period of five days, that is from the ninth to the fourteenth day after the day on which the reported case was attending the school in question. It was found, however, that to follow this plan would have meant complete disorganization of the public school system and, instead, it was agreed by the school and health authorities that the health department would notify the teacher in each instance on what days she must be especially on the lookout for children affected with this disease.

There were 270 deaths from consumption, showing the lowest death rate from this disease with one exception. Doctor Levy expresses his belief that the tuberculosis death rate is really decreasing more than figures would indicate and refers to the fact that the death rates from malaria, pneumonia, and bronchitis have steadily declined, indicating that cases of tuberculosis are now being more correctly certified on the death certificates. The excellent work on the milk supply has been continued; the average dairy score for the year 1912 being 82.5. The average score for the year 1907 was 50.4.

The birth rate was 23.49. Doctor Levy states that in all probability they are receiving at least 90 per cent. of all births. The death rate from infantile diarrhea was 101.1 per 100,000, the lowest rate recorded since the reorganization of the Health Department in 1906. It is interesting to note in connection with the special work being done on the prevention of infant mortality that the death rate among 1,338 infants under observation of the Health Department was 6.7 per cent. while the death rate of the entire 3,069 births was 17.2 per cent. The results seem to have been most excellent although Doctor Levy wisely points out that it is impossible to make any exact statistical comparison. The completion of sewers enabled the Department to do away with 1,375 dry closets during the year and the special work of seeing that those closets which remained in the city were kept in proper sanitary condition was continued. Special reference is made to the work on flies and educational methods used to reach the public.

The net cost of the health department for the year was $43,176.23. An unusually full and excellent financial statement is furnished.

Doctor Levy emphasizes very strongly in his concluding sentences that the good results recorded could not have been obtained without the earnest and intelligent coöperation of his staff and the perusal of the various reports of the bacteriologist, medical inspector, sanitary inspector, and others gives every evidence of the closest kind of coöperation amongst the entire Health Department. Space does not permit referring to the excellent reports of the subordinate officers.

Doctor Levy's report should be read by every health officer. It is a mine of information and inspiration.

Spokane, Wash.

The report of the Department of Health of Spokane, Wash., for 1912 is presented by Mayor Hindley, president of the Board of Health, and Doctor Anderson, health officer. Spokane claims a population of 120,994 and supports an active staff of fifteen members working under the health officer, and an isolation hospital with a staff numbering seven. During 1912, 1.14 per cent. of the city's total expenditures was for health work making a cost of about twenty-eight cents per capita. While the statement of the

death rate is omitted it appears to be 8.48 per thousand. The Board of Health appears to be giving excellent service for the small sum expended.

Mayor Hindley opens the report by calling attention to the true function of the Department of Health as an educational organization, rather than a branch of the Police Department and hopes that this view may be impressed on the minds of the people so that they may coöperate in the movement for a cleaner and healthier city from the standpoint of civic pride instead of from a fear of police coercion. Recent successful innovations are a modern well-equipped isolation hospital which is said to be so attractive that patients wish to return to visit it, in contrast to the old, repulsive "pest-house"; the quarantine nurse whose duty is to visit quarantined homes and assist and instruct those in charge; the municipal dentist who has replaced the dental clinic conducted by the Dental Society and who takes care of cases of children from public institutions when certified by the institutions or the Dental Society.

Active work is being carried out under the health officer in the inspection of sources of food supply, including bakeries, markets, restaurants, and dairy farms and systematic inspection, combined with educational methods have brought about great improvement in the general conditions. The Meat and Market Division, following the custom of annual reports, points with pride to the thousands of pounds of food condemned during the past year and the relatively small number of prosecutions.

The mortality report shows organic diseases of the heart (international classification 79) to be the principal cause of death with a rate of .801 per thousand; cancer (39–45) next with .718 per thousand; and tuberculosis (28–34) and pneumonia (91–92) following with .669 and .661 respectively. The birth rate is 16.02, stillbirth rate .602 and death rate 8.48, as stated.

The report closes with a statement of the meteorological data for the city in the past thirty-one years and a very interesting and readable explanation of and commentary on the tabular statement. This last is prepared by Mr. Stewart, the local forecaster and is a valuable addition since it not only explains much that is not generally understood by the ordinary citizen but also emphasizes the relation between weather and the public health.

Lowell, Mass.

Dr. Pierre Brunelle, chairman of the Board of Health of the city of Lowell, Mass., presents the annual report for the year 1912. Lowell claims a population of 106,294, a figure which is identical with that of the past two years. The cost of the Health Department to the city was sixty-three cents per capita during 1912. The death rate was 17.79 per thousand which is the lowest figure for twenty-three years with the exception of 1904 when the rate, 16.61 was based on an overestimated population. The death rate from cholera infantum also shows a notable decrease but the total infant mortality shows an increase over the two preceding years.

About a fifth of the space in the report is devoted to a consideration of the epidemic of so-called scarlet fever of which 873 cases were reported. The discussion of the epidemic is not very conclusive and covers an unnecessarily large amount of space. Doctor Brunelle doubts the correctness of the diagnosis in many of the cases and suggests that many of them were only "sore-throats" and "skin rashes." He implies that the epidemic was encouraged, given publicity, and generally "boomed" by his political opponents at the time of the winter election and that those who did not associate or come in contact with the opposition newspaper escaped the virulence of the infection. Another interesting feature is the argument which apparently seeks to prove that the old can and measure system of distributing milk is more sanitary than the use of bottles. Following another revolutionary line of reasoning the milk inspector propounds the opinion that in a city the size of Lowell where most of the milk reaches the consumer

within thirty hours after milking pasteurization is rarely necessary; these "rare" occasions presumably being after an epidemic of scarlet fever or typhoid has broken out and been traced to its source.

The report is poorly arranged so that it is difficult to locate any desired piece of information. In addition, a large quantity of apparently useless material is introduced such as a list of the names of the horses and the number of harnesses, curry-combs and bottles of horse medicine belonging to the department. The only notable innovation of the year is a "Temporary Contagious Hospital" which has been arranged in a cottage on the city grounds. Routine work in milk inspection is carried out and samples are analyzed for butter fat and total solids; 350 examinations of milk sediment were made and it is said that "staphlococci, diplococci, bacilli, and in a few cases streptococci were found." The inspector of meats and provisions condemned ten pieces of meat as unfit for food. The tenement house inspector reports 912 inspections during the year but fails to report any other work accomplished.

NOTES.

Important Decision in Regard to Dirty Milk.

"A milk dealer in the city of Washington was tried before the police court of the District of Columbia for having sold milk that was adulterated, in that it "consisted in whole or in part of filthy, decomposed and putrid animal and vegetable substance" and had thereby violated the National Food and Drugs Act. The milk in question contained large numbers of colon bacilli and streptococci, indicating insanitary production or handling of the milk. The defendant was found guilty and appealed, but the Court of Appeals of the District of Columbia sustained the conviction in a decision rendered February 25, 1913. Mr. Justice Van Orsdel in delivering the opinion of the court stated in part as follows:

" 'The facts established by the evidence are that on February 27, 1911, a pint bottle of milk was purchased from one of the defendant's wagons, and taken to the laboratory of the Bacteriological Bureau of the Health Department, where it was analyzed and found to contain 4,500,000 bacteria on ordinary agar, 37° C. grown for 24 hours, and 89,400,000 bacteria per cubic centimeter. On ordinary agar, 25° C. grown 48 hours, it contained 83,000 bacteria per cubic centimeter of the colon group. It showed gas fermentation in one ten-thousandth of a cubic centimeter, approximately 15 drops and one streptococcus to one ten-thousandth of a cubic centimeter.

" 'It appears that the bacterium known as B. coli or colon bacillus originates in and is a normal constituent of the colon of all warm blooded animals, is discharged in the excreta and found in milk as the result of fecal contamination. When present in milk it always occurs from either direct or indirect fecal deposit therein; directly from carelessness in permitting particles of feces to get into the milk during the process of extracting the milk from the cow, or in handling it afterwards; indirectly, from dust, vegetation, water and air, where the bacillus is found—originally derived, however, from animal feces. The evidence discloses the state of the science to be that colon bacillus is a vegetable formation originating in animal intestines, and nowhere else. It is not found in air, dust, water or vegetation under conditions indicating different origin or its original derivation from the substances with which it is thus associated. Under favorable conditions colon bacillus will multiply and develop in milk with great rapidity. The present analysis, in the light of the evidence, reveals the presence of colon bacillus to have resulted from a direct deposit of feces in the milk, due to uncleanly methods in handling the milk.

" 'It is urged that since it is impossible to

produce milk entirely free from bacteria, the statute imposes a duty impossible of performance, and cannot, therefore, be applied to milk; or, if possible of performance, it could only be complied with at so great a cost as to result in the destruction and confiscation of the business. It is not clear from the evidence that the enforcement of the act will produce this result. The present case does not present this difficulty, except in theory; since the contamination was so great as to place it within the statute beyond the domain of speculation. Not only did the milk in question contain bacteria of the colon group, but, as incident thereto, fecal matter, all of which, it appears, may be eliminated by the adoption of cleanly methods in handling the milk. In fact, it appears that samples from the dairy of plaintiff in error have been analyzed, which were free from bacteria of the colon group. One witness testified that he has encountered milk, samples of raw milk and samples of pasteurized milk, free from bacteria of the colon group; has seen samples of defendant's that did not contain them, milk sold as raw milk and analyzed on that assumption.

"'We are not dealing with a regulation relating to milk alone, but with an act generally regulating the sale of food products. Milk is a food product; and, if found to be impure, it will be held to be "adulterated" within the provisions of the act. There is evidence that it is impossible to produce raw milk which does not contain bacteria; that a limited number of bacteria in milk are practically harmless. It is unnecessary to decide whether, under such circumstances, milk would be held to come within the act, since in the present case adulteration is clearly established. The dividing line between pure and impure or adulterated food is in each instance a question of fact; but, because of the scientific distinctions involved, and the impossibility of producing raw milk entirely free from bacteria, it may be much more difficult of ascertainment in the case of milk than of other food products. Owing to the great difficulty which may be encountered in justly enforcing the law, in the absence of a fixed standard defining what is marketably pure and impure milk, in a case where the adulteration consists alone in the presence of comparatively small numbers of so-called harmless bacteria, it may well be that Congress should give attention to this subject, as has been done in many of the States, and establish a fixed standard for marketable milk, whereby milk found to contain a greater number of bacteria than that fixed by the act should come within the condemnation of the law.'

"This decision is of importance to the city of New York, not only in-so-far as that part of its milk supply which comes under the domain of interstate commerce is concerned, but also in regard to that part of the supply which is not so governed. Subdivision 8 of section 53, of the Sanitary Code of the Department of Health, states that milk shall be regarded as adulterated 'which has been diluted with water or any other fluid, or to which has been added, or into which has been introduced, any foreign substance whatever, or which consists in whole or in part of filthy, decomposed or putrid animal or vegetable substance; or if it is the product of a deceased animal.' This section is, therefore, supported by the decision quoted above."

Bulletin, Department of Health, New York City, August 9, 1913.

New Form of Sanitary Privy.

"The need of a more satisfactory method for the collection of human excreta in places where modern sanitary plumbing is not available is often keenly felt, especially when it is necessary to supply it at a cost that is within the means of the ordinary householder, as well as within the means of the average municipality as regards the expense of collection and transportation to a suitable disposal point. As our knowledge increases it is becoming more and more apparent that human excrement is intimately associated with the spread of diseases, especially such diseases as typhoid fever, hookworm disease, summer diarrhœa of children, dysentery, and others, so that to protect excreta from flies and insects, as well as to obviate odors, is a prime requisite.

"In the past, boxes which inclosed the pails have been frequently used; but these were often found to be unsatisfactory because the wood became impregnated with odors and, owing to the constant dampness, there was a tendency to rotting of the wood, all of which gave rise to very disagreeable and persistent smells. Others have advocated the use of screened outhouses in which receptacles could be placed, but the screens are very likely to become useless through deterioration, and cracks and crevices which admit flies almost inevitably appear in such buildings.

"The new design has many advantages not found in other methods, and at the same time it meets the needs of economy, as well as overcomes the objections which have been mentioned. The pail, of which a drawing follows, has already been used very successfully in the Philippine Islands. The details of its construction are shown in the accompanying drawing.

"The frame is made, preferably of hard wood, and consists of four posts, set into a well-mortised frame. The posts are made of such height that, when the seat is placed upon them, an ordinary five-gallon kerosene can may be slipped into the side of the frame and be close enough to the bottom of the seat to prevent the entrance of flies. The post at the back of the frame comes through so that it may serve as a handle by which the closet may be moved from place to place and it also serves the purpose of making the lid self-closing. The can rests upon two cross strips, by which the close fit of the top of the can to the underside of the seat can be readily secured by either planing down the cross pieces when the can fits too tight or replacing them with thicker ones when it fits too loose. By this simple expedient the fit of the can need not be dependent upon absolutely accurate workmanship on the frame. The hole in the seat is cut diagonally because it makes the use of the closet more comfortable as the feet can be put back. The hole is covered with a hinged seat, which is made self-closing by the projection which is put on the post which comes through the seat. The entire woodwork is sandpapered and then well varnished.

"The closet has the advantage of being entirely open, which fact secures good ventilation and leaves no opportunity for the collection of dirt and retention of disagreeable odors which are so common in the boxlike designs heretofore used. The entire frame can be readily cleansed. It is light, easily moved about, and where there is nothing better available can be used as a commode for a sick room.

"On account of the light weight of the can as compared to the wooden pail, it is a much more simple matter to provide for an inexpensive daily collection system. The ordinary cart is admirably adapted for this service and can haul many more cans than it could pails, so that the cost can be kept down to a point which makes it possible to use a suitably located central pit or other means of central disposal. An ordinary night-soil pail costs from $3 to $5, while a kerosene can may be obtained generally at a cost of not to exceed 10 cents. This makes it practicable to use a new container frequently. A wooden pail also has the disadvantage of retaining and giving off odors, which a can has not.

"The cans should be collected every night and replaced with clean ones. The can, as soon as it is removed from the frame, should be immediately covered with a cover of the type shown in the plate.

"The closet also has the advantage of being complete in itself. From a sanitary standpoint it is safe to use it anywhere; in an outhouse, barn, or any place not objectionable from an æsthetic standpoint."

United States Public Health Reports, July 25, 1913.

Insurance Against Small-Pox.

The following note from the *Jennerian*, now incorporated with the *Medical Officer*, should interest the anti-vaccinationists and if the practice spreads may afford an opportunity for those especially rabid members of the clan who still maintain that vaccination is worthless to make very considerable amounts of money.

"A member of the Association of Public Vaccinators writes advocating a scheme for

insurance against small-pox. In his own practice he has already adopted the plan. For the past eleven years he has offered, in connection with every vaccination showing four good vesicles, £50 if small-pox is contracted within ten years. He also gave a written undertaking when small-pox was prevalent in his district to pay a sum of £800 to the person (re-vaccinated) who visited the small-pox hospital daily in the event of his contracting small-pox. This gives the lie direct to statements often mady by anti-vaccinators that no vaccinator has the courage to back his opinions in this manner."

A Rural Campaign Against Tuberculosis.

"As a result of an experiment made in Wisconsin last summer, motorcycles are employed in the Badger State to good advantage in the crusade against the Great White Plague. A rural campaign has been put on by the use of a motorcycle which is believed to be a unique venture of its kind.

"Two health crusaders, a lecturer and an assistant, work together. They would compare with a knight and his squire of olden times, except that they both ride on one steed, a gasoline steed, and differ from the knight of old in that they are independent of the hospitality of castles or monasteries, for they carry a complete camping equipment, sleeping out of doors and doing their own cooking.

"The work consists of placarding the country with health signs and giving talks at creameries, country cross roads and small villages—wherever a crowd can be assembled. A village is usually chosen for an illustrated lecture in the evening. In working the surrounding country during the day time, the health evangelists advertise the evening lecture.

"Stereopticon views are a feature of this talk, which is usually given out of doors. The stereopticon is operated from the luggage carrier of the motorcycle, being connnected with the gas tank, which also supplies the headlight.

"The expense of this work is comparatively small, since hotel bills are eliminated. The ground can be covered rapidly and no time is wasted waiting for trains. As many people can be reached in the country in this manner as by the ordinary lecture tour through cities. After the schools open in the fall, a talk in each rural school will be made part of the program. This work can be carried on about six months out of the year."

Otto F. Bradley in the *American City*, August, 1913.

County Physician or County Health Officer —Which, Mr. Commissioner?

"There are no more 'county superintendents of health' in North Carolina. That official title was a bad one. It has fooled the people of many counties into believing that they were having a certain amount of health work done when, in ninety-five cases in a hundred, there was nothing of the kind going on. Since the first Monday in July, counties have had to choose between the employment of a county physician or a county health officer.

"If a county is interested simply in curing, or, perhaps better, treating or drugging its sick convicts and prisoners and its dependents in the county home, in having a few post-mortem examinations made for coroners, and having one or two lunatics examined a year for commitment to asylums, the official employed to do that work will be known as the county physician. The examination of the dead and crazy, and the treatment of disease in the defective and dependent portion of a county's population, is the least important service that a physician renders, and has nothing to do with health work, which is the prevention, not the cure, of disease. A person employed to do the work of a county physician has no more right to the title of health officer than has the coroner, jailer, or sheriff. He does not do health work.

"Where, on the other hand, a county employs a man to give 95 per cent. of his time to the work of preventing disease, to devising and executing measures to diminish the number of cases of typhoid fever and tuberculosis per thousand of the population each year, to hold down each outbreak of

measles, whooping-cough, diphtheria, and scarlet fever to a minimum of secondary cases, and, in short, to decrease the death rate—the number of people dying per thousand of the population each year—such a man will be known as the county health officer.

"County physicians are the officials who practise medicine and give what little time is left to looking after almshouses, county jails, and convict camps. In taking care of their own practice and in serving the public there is a suggestion of a man's serving two masters. A large number of county physicians in North Carolina are overpaid.

"A county health officer is a man who is not allowed to do private practice. He gives his entire time to the public; his work will be supervised and checked every month by a state official, and the amount of his work compared with the amount of work done by the other whole-time county health officers. The comparative work of whole-time county health officers will be published monthly in the county papers of those counties employing whole-time men. The death rates of a county at the beginning of a whole-time health officer's tenure of office and at the expiration of his term of service will be published, and the people can see whether there has been any decrease in the death rates—that is to say, whether there has been any health work done. The whole-time man serves only the public; he is not serving God and mammon. The whole-time health officers in North Carolina are much underpaid.

"Let county commissioners recognize the difference between county physicians and county health officers; employ the latter, and throw away the former; see that some real health work is done in their county. The state laws no longer permit the people of a county to be deceived by that two-faced title, county superintendent of health, which heretofore has been applied to both county physicians and county health officers."

W. S. Rankin in *Bulletin North Carolina State Board of Health.*

Measures Designed to Assist in the Control of Scarlet Fever and Diphtheria.

The inspection of school children in Oskaloosa (population 1910, 9,466) by the health officer was authorized by the Board of Health of Oskaloosa in 1912. The health officer has been attending to this work in addition to the other duties of his office and during the past year only gave attention to the detection and control of communicable diseases among the children. Lack of assistance has handicapped the health officer considerably and so far has narrowed the scope of the work. At the recommendation of the health officer the Board of Health adopted the following two regulations designed to assist in the control of scarlet fever and diphtheria among the school children.

"Rule 1. All children absent from school for more than four consecutive days shall be examined by the health officer to determine their freedom from any contagious disease of the throat; if found to be free from any such disease or condition they shall receive written permission from the health officer before being admitted to school."

"Rule 2. All children seeking admission to the public schools of the city from outside the city shall be examined by the health officer to determine their freedom from diphtheria bacilli; and if free from diphtheria the health officer shall give his permit for admission before any such children may be admitted to their classes."

According to the requirements of Rule No. 1 all children who have been absent from school for four consecutive days or longer are sent to the health officer's office at the City Hall for examination each morning. The children's throats are examined and they are questioned as to the reasons for their absence and, if ill, as to the nature of their illness. This is useful in finding cases of communicable diseases where physicians were not called, and which the parents might be trying to conceal. According to Rule No. 2 the freedom from diphtheria bacilli is determined by taking throat cultures, which are incubated and examined in the Municipal Laboratory.

Full coöperation on the part of all teachers has as yet not been secured in the enforcement of these regulations, and was responsible for an outbreak of scarlet fever in one of the schools. In this instance an unrecognized case of mild scarlet fever was permitted to return to school after four days absence without the health officer's certificate. This case was responsible for the development of nine cases.

As yet it is impossible to give figures as to the measure of assistance which these regulations will give, but with proper coöperation from the teachers these regulations will materially assist in the control of scarlet fever and diphtheria among the school children.

Mark F. Boyd, M.D., Health Officer, Oskaloosa, Iowa.

New York Smoke Ordinance Unconstitutional.

"In a suit recently brought by the Department of Health against the New York Edison Company in the Court of Special Sessions for infraction of section 181 of the Sanitary Code, which provides that "No person shall cause, suffer or allow dense smoke to be discharged from any building, vessel, stationery or locomotive engine or motor vehicle, place or premises within the city of New York," decision adverse to the department was rendered, and the demurrer of the New York Edison Company was allowed. Justice Russell handed down the decision, in which Justices Zeller and McInerny concurred."

In the decision the ordinance is said to be "unreasonable and arbitrary because of its unqualified and sweeping character, condemning as a nuisance a thing that may or may not be a nuisance, and because it makes no provision for cases where compliance is impossible." The court further states that the present ordinance, prohibiting, as it does, the emission of dense smoke, irrespective of reasonable definitions, limitations and qualifications, is a restriction upon the use of private property and repugnant to the provisions of the Federal and state constitutions that no person shall be deprived of his liberty or property without due process of law.

It is not the intention of the Department of Health to allow the question to rest with the decision above quoted. An appeal will be taken at the earliest possible moment, since the final adjudication of this matter is a matter of first importance to the community.

Analysis of 1,000 Cases of Epidemic Measles.

The American Journal of Diseases of Children for August contains an article by Dr. C. V. Croster of Rosebank, N. Y., on the study of 1,000 cases of epidemic measles occurring among emigrant children at Hoffman Island Isolation Hospital, from December, 1910, to August, 1911. The following, quoted from the latter part of the article, may be interesting to students of public health problems as demonstrating the true seriousness of measles:

"Of the 1,000 cases of measles the greatest number were in the month of June, 186.

"The third year age period shows the greatest incidence of attack, 195. The largest complication percentage, 81.3, and case mortality, 34.3 per cent., are found in the first year period.

"The seasonal prevalence of complication was highest in December, 78.6 per cent., and of case mortality in January, 25.2 per cent.

"It will be seen by Tables 1 and 2 that the greatest monthly percentage of complications occurs in December and January, showing that in every hundred cases of measles in those months, 78.6 and 72.8 per cent. of them suffered from complications. June, with the greatest number of cases, had a small complication incidence, 60.7 per cent. The incidence of complications for the age periods are shown in Tables 3 and 4. It will be seen that the one year age period shows the highest percentage of complications, in that every hundred cases of measles at that age had complication in 18.3 per cent. of them.

"The total number of deaths was 167; case mortality 16.7 per cent. The causes of death for the age periods are given in Table 5. By far the greatest number of fatal cases are due to bronchopneumonia in association with some other complication. With enteri-

tis the number is the largest, 39; with diphtheria, 28; bronchopneumonia alone, 26; with otitis media, 17; empyema, 10, and enteritis alone, 6. The greatest case mortality is in the one year age period, 34.3 per cent. Table 4. The first three age periods together show more than twice the number of fatal cases of all the other age periods combined. After three years the case mortality decreases enormously. Case mortality is nearly equal for both sexes. The greatest monthly case mortality occurs in January, 25.2 per cent., and February, 21.6 per cent. April has the lowest monthly case mortality, 9.5 per cent. Table 2.

"Pertussis was the most frequent of the sequelæ, 32 cases being recorded. Miliary tuberculosis occurred in four cases, with four deaths. A right-sided hemiplegia of face and eyelid was observed in a female child, aged one year, on the thirty-second day of the disease. Recovery took place.

"The most frequent complication was otitis media, 495.

"The most common cause of death, bronchopneumonia and enteritis, 23.3 per cent. of total deaths. Average duration of the fever, four days. The onset of purulent otitis media on tenth or twelfth days may not be attended by unusual fever. If the temperature remains high after the fourth day, a possible grave complication is imminent. An initial high temperature does not necessarily point to a possible severe attack."

The Cost of Homes.

The Bureau of Sanitation of the Cleveland Board of Health has been making a study of the cost of living in various sections of the city and has discovered an interesting, if not surprising, state of affairs existing. *The Survey* of July 26 discusses the work thus far accomplished as follows:

"Fourteen college investigators under Mildred Chadsey of the Bureau of Sanitation have been going after the facts in both sections. They show that it costs more to occupy hovels than homes. The rent per room is more in the poorer than in the better section.

"Here are the figures, boiled down from the reports of 1,569 houses in the poorer section and 2,355 in the better. The rent for one room is $3.50 in the slum district as against $3.46 in the section of real homes; for two rooms, $4.96 as against $4.67; for three rooms, $6.73 as against $6.60; for four rooms, $8.87 as against $8.85; for five rooms, $11.41 as against $10.83; for more than five rooms, $14.23 as against $14.83. In every case, except the last, it is cheaper, so far as rent is concerned, to live in a little home with trees and a garden in front and a yard behind than to live in the dirty, slovenly, cramped quarters of the Haymarket.

"A study of industries revealed that the opportunities for work are about the same in the two sections. Both are bordered by large factories. If there is any difference, it is that the factories in the outlying section experience more difficulty in getting help and hence offer a greater demand for workmen than the factories nearer the center of the city. It seems to be the old desire to live near friends and fellow countrymen rather than any real economic necessity that causes multitudes to crowd near the brightly lighted main streets of the city instead of living in the more quiet, open community of small houses.

"The cost to the city of bad housing conditions is being brought out in such sharp relief that it will not readily be forgotten. In one ancient wooden dwelling, for instance, fourteen families live. They all use the same water faucet in the yard and the same sewer vault. Recently measles entered this old house and spread from family to family until it became a veritable epidemic. Right on the heels of this came an epidemic of diphtheria which was followed by scarlet fever. For six months the house was kept in quarantine, with two sanitary officers constantly on duty at a salary expense to the city of $1,000.

"Such are the serious financial penalties for civic thoughtlessness—not to speak of serious moral and social penalties—that the investigation is bringing to light. The two sections are being compared as to morbidity and mortality rates, tuberculosis, juvenile delinquency and crime. The results will be tabulated in 'cost charts' and placed in a permanent health exhibit in the City Hall."

Health Education by Means of Motion Pictures.

"The Department of Health is now running in the nickel theaters of the more populous sections of the city, its educational motion pictures depicting (a) the summer care of babies and (b) the necessity for reporting births. During the last twelve days these picture lessons have been shown to audiences totalling 25,615 persons, or an average of 2,135 per day.

"As a means for reaching the people most in need of health instruction these pictures have been found most effective. Their particular advantage over other forms of educational endeavor lies in their ability to attract and hold attention and to be readily understandable to all nationalities, regardless of language.

"During the coming week these pictures will be on exhibition in the nickel theaters located in the ninth, tenth and twentieth wards."

Bulletin of the Chicago School of Sanitary Instruction, July 26, 1913.

Discontinuance of Removal of Bedding after Certain Infectious Diseases.

"After cases of diphtheria have been removed to the hospital during the height of the disease, or the patient has died during the same period, fumigation of the premises will be performed, but bedding will not be removed. After cases of diphtheria, which terminate in recovery, fumigation will be omitted and bedding will not be removed. The woodwork of the room in which the patient has been isolated must be thoroughly scrubbed with a hot soda solution, one-half pound to three gallons, and the room thoroughly aired for at least twenty-four hours before again being occupied.

"After death or recovery from scarlet fever, or after removal of the patient to the hospital, the premises will be fumigated but the removal of bedding will be discontinued.

"When cases of measles have died during the height of the disease or have been removed to the hospital during that period, the premises will be fumigated but bedding will no longer be removed. When cases of measles terminate in recovery the woodwork must be scrubbed with a soda solution as above described, but bedding will not be removed.

"After cases of cerebro-spinal meningitis and anterior poliomyelitis have been removed to the hospital during the height of the disease or have terminated in death during the same period, the premises will be fumigated but the removal of bedding will be discontinued. After recovery, the premises will be cleaned and scrubbed, but bedding will not be removed.

"In exceptional instances, as for example, when physicians or members of the patient's family particularly request that goods shall be removed for sterilization, the Borough Chief will direct that this shall be done provided he deem it advisable. In special cases where proper and efficient fumigation cannot be performed on account of the nature of the premises, bedding will be removed and disinfected. The bedding will also be removed as formerly after cases of small-pox, cholera, plague and yellow fever."

Weekly Bulletin of the Department of Health of New York City, July 26, 1913.

Acohol, and the Public Health.

"In his account of 'the influences and conditions, injurious or dangerous to the health' of the Burgh of Clydebank, Dr. T. M. Strang, Medical Officer of Health, publishes an out-and-out denunciation of the 'ease of access of the people to alcoholic drink.'

"After declaring that indulgence in alcohol produces a great and generally deleterious effect on the health of the burgh, he continues 'Could alcohol in all its forms be abolished from the community it could almost be guaranteed that the death-rate would fall 1 per 1,000 per annum at least. That the state of matters at present existent in this and other similar communities has been allowed to survive so long is a cause of wonder to anyone who is conversant with the facts to any sma'l extent and reflects on them. The time of legislators is occupied in trimming the outgrowths of social evil which have risen largely from this root, but the root itself manages to get left alone or, at the best, simply restricted and regulated.

No municipalization, no disinterested management, will prevent people getting drink—and taking it home or elsewhere—as long as it is on sale anywhere. Would the absolute and sudden withdrawal of it from the community or country do anyone any harm? As a medical man, I know of no condition affecting bodily health which would be prejudiced by such a measure. What a different appearance our town has on a holiday when all the drink shops are closed by recommendation of the magistrates to what it presents on holidays when these are open. There is seldom a holiday time in which I do not see a death either from accident or otherwise which has been directly due to alcohol, but these deaths do not appear in our returns as due to alcohol—very few do. Not only are there direct deaths; we cannot compute with any accuracy the numbers of children who are starved and neglected and have their bodies reduced, so that they cannot resist disease when it comes, because their fathers and their mothers spend their means on drink. The lot of the laboring man is a hard one, and it is said he finds a solace in drink to be found in no other way; it is for him a sort of chloroform from misery and hopelessness. He soaks in it at every opportunity, reduces the powers of resistance of his body to disease and succumbs to pneumonia, bronchitis, or consumption, more readily than sober men. Most towns like ours have hundreds of such men, many of whom make as much as 7*s.* per day in ordinary good times, and are paid daily and drink nightly. Many of them live away from their families for the sake of this freedom for self-indulgence, while the families may be a charge on the rates of some distant parish. When these men take ill the usual thing is the parish doctor and the parish hospital and poor-house, at the public expense; the good wages have gone nightly into whisky. There is indisputable evidence given us by the life insurance companies, which keep separate records for total abstainers, that they live many years longer than even the moderate drinkers, their conditions of life being otherwise similar. With these reflections we welcome the evidence that public opinion is slowly but surely coming to the conclusion that drastic powers must be placed in the community's own hands, and there is little doubt that when the people wake up to the facts they will soon rid themselves of this canker.'

"Dr. Strang ends by declaring that there is no reason in making war on consumption, war on poverty and bad housing and sickness in all forms, and spending millions on it, without at the same time attacking this *causa causans* of all these evils."

The Medical Officer.

The Treatment of Cholera Carriers.

The Tropical Diseases Bulletin for July 15 reviews an article by Salimbeni and Orticoni on the treatment of healthy carriers of the cholera vibrio by enemas of specific serum. While the experiments quoted are not sufficiently extensive to show definite results they may be suggestive to those who are experimenting on methods of treating typhoid carriers. The review follows:

"During an epidemic at Marseilles in 1911 thirty-four persons in one asylum were found to be carrying the vibrios without showing any definite symptoms of cholera, although some had slight choleraic diarrhœa. All these were treated as follows: Each received an evacuating enema and from the fæces so obtained cultures were made. Immediately after this an enema of 50 cubic centimeter of cholera serum in 200 cubic centimeters of salt solution was slowly injected, attempt being made to let the injection penetrate as far into the intestine as possible. In 9 out of the 34 the vibrios had disappeared at the time of the first injection; in 22 of the remainder they disappeared within 2 days, and in the 3 others in 3 to 6 days after the injection. None developed cholera. The numbers are small, but in another hospital several carriers continued to excrete the organisms for 15 days, and at least 2 developed cholera and died; and the authors consider that the treatment is worth a further trial. In none of their cases could they detect the presence of cholera antibodies in the serum of the patients treated."

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THE PRESIDENT'S ADDRESS.

RUDOLPH HERING, D. Sc.,
New York City.

Read before the General Sessions, American Public Health Association, Colorado Springs, September 9, 1913.

It is with an unusually deep sense of appreciation that I deliver to you today the annual address of your President. This association was founded by, and during its early life consisted almost exclusively of, medical men, until within recent years men of other activities were called upon to assist upon the fields of public health. Among the new professions thus entering this domain was that of sanitary engineering. For the first time in the history of the association your President has not been a physician, but an engineer. This recognition of the engineering profession by calling it into partnership in the deliberations concerning public health questions has been greatly appreciated by it, and I desire to express this fact, and to add that this partnership with the engineer, whose duties embrace the practical ways and means of carrying into useful effect the results of medical science so far as they apply to public health, should result in large benefits to our people. And, personally, I cannot adequately express my feelings as to the depths to which I appreciate the confidence and the honor you have placed upon me by selecting me to represent my profession in this common cause. I can but devotedly thank you for this most highly prized distinction.

The engineering profession, in directing the application of the various materials and sources of power for the use, convenience and health of man, has in the last century proceeded with greater speed and vigor than ever before. The reason is, as Professor George F. Swain has said, that the engineer is an applied scientist, able to furnish necessities, comforts and even health to our people to an extent of which former generations never dreamed of nor thought possible. Engineers are, therefore, being brought in to help in directing aright the tendencies of the day. Based only upon known laws of nature, engineering has a firm foundation. Whether for sanitary or commercial purposes, it should, therefore, be reliable and make a safe partner in the field of public health.

Prevention of Diphtheria Epidemics.

Dr. S. C. Lind, Medical Inspector of Public Schools of Cleveland, reports in the June number of the *Cleveland Medical Journal* two interesting cases in his experience where diphtheria epidemics were stopped by the identification and exclusion of carriers after fumigation had proved ineffective. His paper is quoted in part as follows:

"With the recent literature so filled with reports of diphtheria carriers, their menace to the community, and various methods employed in freeing them from the bacilli, it may be of at least local interest if a brief report is made of carriers discovered in two of our public schools. No sooner had the schools opened last fall than a veritable epidemic of diphtheria began. It will be remembered that from October until December there was considerable agitation both in the profession and among the laity over the large number of cases of diphtheria reported. The majority of those attacked were school children, which made the outbreak of peculiar concern to the school medical inspectors.

"Diphtheria first appeared in Scranton school, September 27, in Room 8, and except for one case developing after October 16, remained localized in this room. As soon as a case was reported vigorous fumigation was begun, work then resumed and still diphtheria developed. On September 27, two children were absent on account of diphtheria; three days later, two others did not come to school, while on October 3, a fifth was attacked. With the coöperation of the City Health Department it was decided to take cultures from the entire room. Four carriers were found, excluded from school, much to the disgust of the parents, and no other cases of diphtheria developed. As mentioned above, a child in one of the other rooms became ill with diphtheria. This, however, was the last case to occur in this building.

"With this experience in mind, a case of diphtheria having appeared in both the morning and afternoon kindergarten classes at Orchard school, routine throat cultures were again taken. Three carriers were discovered, one attending the morning session, while the other two were enrolled in the afternoon class. These children were excluded, and no further cases developed.

"Here is illustrated the folly of fumigating school rooms while diphtheria bacilli are harbored by the well. Taking cultures from even the youngest pupils was not difficult, and only in this way are we able to discover carriers. None of these children were ill at the time nor did they later become sick. Throat inspection in each instance showed a normal condition. The importance of routine cultures cannot be overestimated. The active, acutely ill case is not the one of greatest danger. Such a person is in bed and measures minimizing his danger to the well are taken. Quarantine is established and antiseptics are freely used. The healthy carrier is the real menace and he is a very potent factor in the spread of diphtheria."